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THE FARMER.

COMPILED BY

GEORGE NICHOLLS, ESQ.

BIBLIOTHECA BODLEIANA

LONDON:
CHARLES KNIGHT AND CO., LUDGATE STREET.

1844.

LONDON: PRINTED BY WILLIAM CLOWES AND SONS, STAMFORD STREET.

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PREFACE.

Two large editions of a work similar to the present, under the title of 'The Farmer's Guide,' have been printed and circulated in Ireland, with the view of imparting useful information to the small Irish farmer, and stimulating him to the adoption of improved methods of cultivating his land; and the Editor feels great comfort in the belief, that his little compilation has in these respects been productive of good.

Several persons, of whose judgment the Editor entertains a high opinion, having urged him to publish another edition of the work, with such alterations and additions as were necessary for adapting it to the state of Agriculture generally, he set about the task with the same view that first led him to enter upon the undertaking in Ireland; and the result is here presented to the public.

It is hoped that this compilation may prove useful to our small farmers, by placing before ments, and the habits and condition of the agricultural labourer,—an object of the deepest interest and highest importance, whether regarded in a local or a national point of view; and it is hoped that those observations, however briefly and imperfectly made, may serve to awaken useful reflections, and lead to a closer consideration of the duties, relatively and individually, of the several classes engaged in the great business of agriculture in this country.

THE FARMER.

INTRODUCTION

AGRICULTURE may be defined, as the art of raising the greatest amount of produce from the land, at the least cost, and for the longest period, without exhausting the soil. This is the great object of the farmer, and all his operations should be governed by the plain every-day principle involved in this definition of his art. To attain this object, and to carry on his operations with success, forethought and industry are necessary, and a mind capable of perceiving, and ready to adopt, all available improvements.

The occupier of a neglected ill-managed farm, will not unfrequently complain of his poverty, or the poverty of the soil; and if another farm of similar soil, but successfully managed, is pointed out to him, the answer is, "Oh! but it has advantages which my farm has not."—And what in reality are these "advantages?" —Industry, good management, and economy,—it is the steady persevering exercise of these qualities, which has made the swamps of Holland more productive than the rich plains of Italy; and it is only by the exercise of these qualities, that success and prosperity can be secured to the British Agriculturist.

In different parts of the country, different modes of cultivation prevail, arising from custom, or local peculiarities; but as a general rule, it may be safely affirmed, that the mode of cultivating the land which yields, and which will continue to yield, the greatest quantity of produce at the lowest cost, is undoubtedly the best. If the land were intended to feed farmers only, a sufficient amount of produce might be obtained with a small amount of labour: but there are other classes to be fed, and the farmer must give a portion of the produce of his land in exchange for other produce. Hence every individual, of every class, is interested in the due cultivation of the soil; and hence, likewise, the necessity, on public as well as on private grounds, for producing the greatest quantity of food, at the least average cost.

The house and offices on a farm, are of much importance, as respects its profitable and convenient occupation. If the house is too small, or in bad repair, the comfort of the farmer is unduly restricted; and if the yards and outbuildings are not sufficient for the stock, and the necessary operations appertaining to the farm,—or if they are so arranged as to cause a loss of time and labour, or a waste of provender or manure,—the farmer is thereby placed at a disadvantage, from which it is alike the interest and the duty of the landlord to relieve him, by causing the necessary additions and alterations to be made, so as to enable him to make the most of his farm.

The size of the farm-house, and outbuildings, must of course be regulated by the size and nature of the farm; but they should be so placed as to economize labour as much as possible, and that every part may work conveniently with the rest. In general, the buildings should be arranged in a quadrangular form, surrounding the yard or yards in which the cattle and pigs are fed, and in which the manure is accumulated. A tank or receptacle for the urine and liquid manure, should be constructed in some convenient spot; and into this covered drains should be carried from the cow and cattle houses and pigsties, and also from the house, unless a separate tank is formed close to it for receiving the slops and washings.

The great majority of farms are of a mixed character, comprising both grazing and tillage lands; and where this is the case, the yards and outbuildings must be prepared accordingly. There ought likewise to be cottages on every farm, according to its size, for the labourers and their families, whose comforts should not be overlooked.

Young single men, hired by the year as farm servants, may reside in the house with the farmer, who will then be enabled to superintend their conduct—an object of great importance, that has of late been too much neglected. The same may be said with reference to the female servants, to whom the mistress stands in the relation of a parent. The heads of families have a serious duty to perform in these respects, their example and precepts governing in a great measure the moral conduct and habits of their dependants.

The farmer who wishes to thrive, must not only be active and industrious in his own person, the first up, the first a-field, and the last in the house at night: but he must also attend most carefully to receipts and expenditure, and keep an accurate account of every transaction, so as to be able to see, at any moment, how he stands generally, and what is the state of profit or loss in each particular department, whether of live stock, corn, or other produce. Full and accurate accounts are the groundwork of success in business. Without these, neither the farmer, the merchant, nor the manufacturer, can hope to prosper.

The farmer should likewise keep a Labour Book, in which to record daily the names of his labourers, and how and where each has been employed; and also a memorandum book, for recording, from time to time, observations upon occurrences and matters of interest on his own or the neighbouring farms,—such as experiments on manures, or particular modes of cultivation, or anything, in short, calculated to be useful or interesting to himself or others. Such memorandums, if made accurately at the time, may afford important information at a future day.

Every considerate landlord, will be forward to assist a good tenant in making improvements upon his farm. The immediate benefits of such improvements will be enjoyed by the tenant, but the eventual, the permanent benefits will belong to the landlord. Both parties are benefited, the one immediately, the other remotely; and both should join in bearing the cost, in such proportions as the circumstances in each case may equitably warrant. The usual mode of dividing the charge, is for the landlord to find materials, and the tenant labour; but this may require to be modified in certain cases, having regard to time, and the nature of the improvements entered upon.

But an intelligent landlord will not only be ready to contribute towards the expense of improvements, he will take all opportunities of stimulating his tenant to undertake them, and will aid, advise, and encourage him during their progress. If draining or fencing is required, the landlord's eye will detect the want, and his counsel will point out the remedy. If the farm buildings are defective, or insufficient for the proper accommodation of the stock; if tanks for liquid manure are to be constructed, or a better disposition of the outbuildings is to be made, with a view to economizing labour, and the more profitable occupation of the land, the landlord will not be backward in doing whatever may be requisite on his part.

A farm may be compared to a great machine, the value of which depends on its profitable working, and this will depend upon its completeness in all its parts. It is, therefore, most decidedly the interest of its owner to see that nothing is defective about it; whilst the occupier has also an interest in this respect, proportionate to the expected duration of his occupancy, and the amount of outlay he has incurred: for without some kind of assurance or certainty that he will be permitted to reap the fruits of his outlay, a tenant can hardly be expected to incur the risk and expense of improvements. Whether this assurance, this certainty is given in the form of a lease for a term of years, or by the custom of the country, or by such an understanding between landlord and tenant as will relieve the latter from all apprehension on the point, does not appear to be very material; but it is assuredly of the very first importance, that there should be no doubt or misgiving in the matter. The tenant must feel secure, or he will not improve; and the imparting of this feeling, in whatever shape the security may be given, rests with the landlord.

An intelligent landlord may moreover do much for his tenantry in other respects, by imparting information on all matters connected with agriculture—by circulating or distributing useful publications among them, and thus bringing under their view the results of experience in other districts, or in other countries. He may also confer a most material benefit on his tenants, at little risk or cost to himself, by making experiments on the comparative advantages and disadvantages of different modes of cultivation — on the qualities of different manures, and the best mode of collecting and applying them—on the natures of the several soils—on the best rotation of crops. He might likewise make trial of the various implements from time to time invented, with a view to economizing labour, or the more perfect working of the land; and such as he finds to be worthy of adoption, he might recommend or procure for his tenantry,—all improvements in the mode of cultivation, leading to an improvement in their condition, and virtually to an improvement in his own.

The judicious landlord will not fail to pay attention to the stock of his tenantry, and assist them in obtaining the best breeds. Perhaps there is no part of the duty of a good landlord that can be more readily, extensively, and beneficially exercised than this. Bad stock is destructive to the farmer, and yet it is not always within his reach—certainly it is not always within reach of the small farmer—to obtain stock of a better description, which can only be done by a large outlay, or by procuring males of approved breeds at a considerable cost. In such cases, the landlord should assist his tenantry, by procuring for them males of the breeds best suited for their purpose. If this course were adopted by landlords generally, it would in a few years lead to the extinction of all the bad and inferior breeds of stock which are now so frequently seen, to the farmer's injury and the country's loss.

A considerate landlord will also attend to the state of the cottages on his property. He is aware how much the health, comfort, and correct moral conduct of the labourers and their families, will depend upon the condition and arrangement of their dwellings; and he will take especial care that the cottages on his estate are constructed with a due regard to these objects,—that there is proper drainage and ventilation, and that the rooms are sufficient in size and number for the accommodation of the labourer's family, without young persons of different sexes being compelled (as is now too often the case) to sleep in the same apartment, to the subversion of decency and decorum, and to the destruction of those feelings of delicacy and moral restraint, which constitute so important a safeguard to correct conduct in after-life.

It is only by attending to each and all of these points that the best results can be secured for the landlord, the tenant, and the labourer, each of whom will then form a part of one great domestic whole, bound together and identified in interest and in feeling—each ready to support the other in the various contingencies of life, and in working out the great problem of obtaining the largest amount of produce from the land, at the smallest cost, and for the longest period. How this important object is to be accomplished, is proposed to be shown under separate heads, in the following pages.

CLIMATE.

In all agricultural operations, attention must be paid to the nature of the climate. The climate which permits field labour for the greatest number of days in the year, and which brings forward and ripens the largest amount of produce with the greatest degree of certainty, must be considered the best; and the worst kind of climate is that which is unequal, and subject to great and sudden changes. From this latter cause, in some countries, entire crops are often destroyed, at one time from continued drought, at another from excess of rain; whilst sometimes nearly equal injury is done by blight and mildew. The climate most desirable for the agriculturist is that affording a dry seed-time, with spring showers, summer and autumn heats, and winter frosts in seasonable succession.

The elevation of the land has great influence on the climate. In proportion as the height is greater, the air is found to be colder, lighter, and thinner, and is less in quantity in a given space. A person breathing at the top of Mont Blanc draws into his lungs only half the quantity of air which he breathes at the level of the sea, and the air is colder in the same proportion. Vegetable life is affected in this respect similarly to animal life. At a great elevation, vegetation cannot proceed with the same energy as in a low-lying country; and from the retarding effects of cold, and a deficiency of atmosphere, vegetation is slower on high than on low grounds. In general, an elevation of 400 feet above the level of the sea, is fully ten days later, and requires ten days' earlier sowing, than on lands about the level of the coast.

Climate is also affected by situation, and the nature of the country. Vicinity to the sea, which is the great equalizer of temperature, and the interposition of hills to break the force of the winds, generally moderate the severity of a cold climate. The same causes will also increase the dampness of a climate, for hills attract clouds, and bring down rain. A climate possessing a due proportion of moisture and warmth, of sunshine and clouds, is best adapted for vegetation.

Grain crops will ripen well in a moist climate, provided there has been a dry seed-time, and that the soil be well worked and open, to allow the superabundant moisture to escape. This, in fact, involves one of the great principles of modern husbandry; for the effects of an over-wet climate may in great measure be obviated, by adopting proper methods of draining the land. Draining imparts dryness and warmth to the soil, and will thereby serve to improve a naturally cold and moist climate; and to this very important branch of agriculture too much attention cannot be paid. In proportion as the land is cleared and drained, the climate becomes drier, more regular and more equable in temperature: but if moisture is allowed to accumulate in bogs, morasses, and stagnant ditches, it thence rises in clouds and fogs, obscuring the sun, and chilling the atmosphere.

In countries where the frosts of winter are long and severe, a correspondingly large quantity of snow falls, to cover and shelter the ground. Without these deep snows, the plants and vegetables would probably be destroyed by the intensity of the cold. Snow is therefore most valuable as a winter covering for the herbage, and for preventing the escape of its natural heat from the earth. This is very apparent, on the melting of snow, after it has lain any time on grass lands.

SOILS.

The soil or surface of the earth consists, for the most part, of the crumblings and decayed portions of rocks, and its quality depends on the nature of the substances whence it is derived. Rain, sunshine, frost, the action of the atmosphere in all its stages, are constantly effecting the decomposition of rocks, and separating minute particles from their surface, to form a soil above and around them; whilst the rivers and running waters transport portions of the matter so separated, to lower levels. By this process, during a long course of years, our fertile valleys and rich meadow lands have been gradually formed.

Sand, clay, and lime, are the principal constituents of all the different kinds of soil; and it is by ascertaining the nature of the soil in every case, and so managing the land as to bring out and improve its capabilities, that the profit of the farmer is to be secured.

Each soil has its natural limits, beyond which the application of manure alone will not carry its powers of production. The farmer's object must therefore be to raise the quality of the soil, by infusing into it new elements of fertility, in which it was before deficient; such as the mixture of clay and marl with sandy and peaty soils, chalk with the clays, and lime with loamy and alluvial soils. In this way the qualities of each description of soil may be improved, and its productive powers greatly augmented.

Soils differ greatly in colour. Some are nearly black, others white, red, and brown, according to the nature of the subsoil, or the rocks out of which they have been formed. Peaty soils are invariably black, or a very dark brown, whilst combinations of iron impart a red colour to the soil, without, however, impairing its fertility.

Soils may be classed under the following general heads, viz:—sandy, gravelly, clayey, chalky, alluvial, loamy, and peaty.

Sandy soils. Pure sand or silex is the earth of flints, and in its simple state is incapable of retaining moisture or promoting vegetation; but when clay, marl, loam, or other soil possessing adhesive qualities, are mingled with it, it may be cultivated with advantage. The Norfolk farmers have, by means of such applications, improved their sandy and naturally sterile soil, and rendered it eminently productive.

When properly prepared, a sandy soil is one of the most profitable which can be worked. It is easily cultivated, and is well adapted for occasional pasturage, and for turnip feeding of sheep. The crops to be raised on sandy soils, are—turnips, potatoes, carrots, mangel-wurzel, barley, rye, peas, clover, and all the grasses; but this species of soil is not, generally speaking, sufficiently strong for beans and wheat.

Gravelly soils, are in their nature very similar to the sandy, and require nearly the same treatment. They are in general considered hungry soils; for being of an open texture, the moisture sinks rapidly through them, and their fertility depends on frequent falls of rain, as well as upon a liberal application of manure. They are adapted to the production of potatoes, turnips, and the grasses, and are well suited to a moist climate.

Clay soils. Clay or argillaceous earth, in its ordinary condition, is one of the most difficult kinds of soils with which a farmer can have to deal; but it may be greatly improved by the application of sand, lime, marl, chalk, and all kinds of calcareous matter. Ashes, peat, farm-yard manure, the sweepings and scrapings of streets and roads, are all suitable for clay soils; and by a liberal use of these materials, with draining and careful working the land, such soils may be rendered highly productive.

Clay soils are often of so stiff and adhesive a nature, that they continue moist throughout the summer. The plough turns up the soil in strong clods, which are with difficulty broken by the roller. It requires both labour and expense to put such soils into a good state of cultivation, but it may be done, and will in general well repay the outlay.

This soil is adapted for beans, wheat, oats, peas, clover, and tares. Formerly potatoes and turnips were little cultivated on clay soils; but under the modern system of draining and improvement, these roots may now be grown on them to advantage. They are well adapted for hay or clover, but do not generally produce good pasture. Ashes, peat earth, and all other light substances, are useful for lightening and mellowing clay soils, and chalk can hardly be applied in too large quantities.

Chalky soils, consist for the most part of calcareous matter, but often mixed with other substances, in greater or less proportion. When much clay and other earthy substances are found mingled with the chalk, the soil is heavy and productive; when sand and gravel abound in it, the soil is light and not very fertile. The crops chiefly cultivated on chalky soils are peas, turnips, barley, clover, and wheat; and however much the soil may be exhausted, it will produce sainfoin, which indicates that when exhausted by other crops, the growth of sainfoin will serve to recruit the soil; and it is accordingly extensively grown in the chalk districts of the south of England.

Alluvial soils, are composed of the finest parts of earth and clay, washed off by rain and running waters, and deposited in low-lying situations, in valleys through which the rivers flow, and on the shores of estuaries, where they are increased by the flowings of the tide, and enriched by the deposit of marine productions. Alluvial lands have generally a level surface, and yield abundant crops of grass, as well as of wheat, oats, barley, beans, peas, clover, and tares; but from their being for the most part low and consequently damp, they require the occasional application of lime, and the ditches and drains should be carefully attended to and kept open.

Loamy soils, consist of clay, sand, and calcareous matter, with a certain portion of vegetable mould, and may be described as being less tenacious than the clay, and more so than the sandy. Loams are the most desirable of all soils for the farmer; the clods are easily broken, and the land can be worked at any season of the year. Loams are ploughed with greater facility than clays, and bear better the vicissitudes of the seasons. They are well adapted for convertible husbandry, and may be changed generally with benefit, from grass to tillage, and from tillage to grass.

Bog, *moss*, or *peaty soil*. This soil prevails to a great extent in Ireland and Scotland, and to some extent also in England, especially in the western districts, which are the most humid; and moisture is necessary to the growth of peat. Peat is supposed for the most part to have had its origin in the destruction of ancient forests —the trees, felled by the tempest, or brought down by natural decay, and left upon the ground, became covered with moss and lichens; and the free passage of the water being thus obstructed, aquatic plants, such as reeds, rushes, horsetail, marsh trefoil, &c., spring up and decay, leaving a stratum of vegetable matter, which we call peat, and which increases every suceeeding year.

The aquatic plants grow in greater or less abundance, according to the quantity of moisture, and this accounts for the bogs being deeper in some places than in others. The hollows retain moisture, and here the aquatic plants are most prolific, and the hollows gradually become filled up. The peat or moss thus formed is essentially a vegetable substance, which has undergone a certain change, without being entirely decomposed. Water is indispensable to the formation of peat, whether on high or low lands, on the summit or sides of mountain ranges, or in valleys or hollows; and as the ground is more or less wet, different plants will be produced.

Peat possesses an astringent quality, and preserves bodies immersed in it, which probably arises from the decayed bark of trees, and the vegetable gum and resin which it contains. It is also probable that the plants themselves of which the bog is composed, by the action of natural agents, may have acquired an antiseptic property, checking their own decay.

In some cases, lakes and deep pools have been filled up, by the gradual accumulation of the peat; and it has been observed that fermentation occurs where this has taken place. Gaseous matter is then thrown off, and the neighbourhood of such a moss is often found to be unhealthy; but dry peat soils are always considered healthful.

Subsoils.—In the selection and management of any of the foregoing soils, the nature of the under or subsoil should not be overlooked by the farmer; for it always has a powerful influence on the productive properties of that which lies above it.

With a shallow subsoil, it is impossible to cultivate to advantage tap or tube rooted plants, such as carrots, parsnips, turnips, mangel-wurzel, or potatoes, for these always endeavour to extend their roots to a considerable depth, and if there is not a sufficiency of soil for them to work in, they will not flourish. Shallowness of the soil may, however, generally be in a great measure remedied by the use of the subsoil-plough, which breaks up and loosens the hard substratum, and prepares it for being turned up and converted into active soil. By this operation, with previous thorough-draining, almost any description of soil may be rendered capable of bearing good crops.

The natural quality of the soil will sometimes be indicated, by the kind of vegetation which it spontaneously produces; but this is not always a sure test, although whenever there is an excess of moisture, it will generally be accompanied by the growth of rushes, and thus point out the necessity for draining. Scanty herbage may arise from the poorness of the soil, or from a deficiency of moisture; and in a wet season a thin poor soil may appear clothed with luxuriant vegetation, whilst a strong clay soil will be the reverse. In judging of soils, therefore, the state of the weather must be taken into account, and we must not be altogether guided by the appearance of what we find on the surface.

AGRICULTURAL OPERATIONS.

Agriculture may be successfully practised, especially on a small scale, without a very profound or scientific knowledge of its theory, although this occupies a prominent place in most books on the subject; and not improperly so, for many valuable improvements have been suggested by scientific men, who were not themselves practically conversant with the details of farming. Nothing will, however, be here recommended for adoption, which has not been proved in practice; and in the following directions, the farmer will obtain the benefit of a large experience, without incurring the risks which usually attend experiments in agriculture.

In considering the crops to be raised, attention must be paid to the height above the level of the sea, for the greater or less elevation of the land has a material influence on the quality of its produce. In the higher districts the growth is slower, and the herbage is less succulent and nourishing; and when in grain, the head is smaller, the plant runs more to straw, is less perfectly ripened, and the harvest is later.

The ordinary height at which common grain crops can be raised in the British Islands, is from 600 to 800 feet above the level of the sea; but in some favourable situations, tolerable crops of barley and oats may be produced at a height of 900 or 1000 feet. In proportion as the climate is improved by sheltering plantations and drainage, the height at which grain crops can be successfully grown becomes greater. Good crops of barley and oats are raised near Edinburgh, at a height of 800 feet; but in general, it is more advantageous to devote such high grounds to pasture than to tillage.

Land on the banks of a running stream is more salubrious for crops, than that which is near sluggish brooks or sedgy lakes. From stagnant waters, in certain conditions of the atmosphere, noxious vapours arise, which steal along the surface of the adjacent grounds, and blight and injure the crops. Running waters, on the contrary, serve to purify the air, and are of great advantage for crops and cattle.

A long carriage to market is a great drawback to the agriculturist, and where bad roads interpose, a few miles are practically equivalent to a much greater distance. The value of a farm will therefore depend, in no inconsiderable degree, upon the goodness of the roads which surround it, and on the facility of conveying its produce to a good market.

Farming operations are so many and so various, that it is necessary to be brief in speaking of each, in a work like the present; and we therefore propose to give only the more important and generally essential rules, for the management of grass and arable lands, and the reclaiming of waste lands, together with such suggestions and observations as may naturally arise out of the subject. It is hoped, nevertheless, that nothing which it is very material for the farmer to know, will be omitted, except it be in items of mere detail, with which every farmer must be presumed to be conversant.

We will, in the first place, make a few observations upon Grass Lands, before proceeding to speak of the improvement of Waste, and the cultivation of Arable Lands.

GRASS LANDS.

Grass lands are of two kinds, *Meadow* and *Upland*, each differing from the other, and each likewise varying considerably in character and productiveness, according to the nature of the soil and local situation.

Meadow Land is for the most part low-lying, and of alluvial formation. It generally produces luxuriant crops, and its natural fertility renders the large and frequent application of manure less necessary than on the uplands. Meadows are, however, from their situation, liable to an excess of moisture, from which they must be protected by drains and water-courses, or their productiveness will be seriously impaired.

Most of the hay consumed throughout the country, is the produce of meadow land. Where the requisite quantity of stock is kept, all the hay is generally consumed on the farm, and such a portion of it is again returned to the soil in the shape of manure, as will serve to keep up its fertility. In the neighbourhood of towns, the hay is often sold off the farm for use in the town, the facility of obtaining manure in such situations, enabling the farmer to dispense with farm-yard dung, both for his grass and arable lands.

It is very certain that meadows, however naturally fertile, will, like all other lands, become exhausted by continual cropping, and require applications of manure in proportion to the quantity of produce removed from them. The soil must be rich indeed that will bear uninjured a second crop of hay, without being renovated by manure of some kind, such as town or farm-yard dung, composts of earth or ashes, or lime, marl, chalk, or other calcareous matter; and no judicious farmer will ever subject his land to such an exhausting process.

Wherever the means of irrigation exist, the fertility of meadow lands may be kept unimpaired for any length of time, without other manuring than is obtained by the passing of the water over the surface; provided that this is duly attended to, and that the land is properly drained, and kept free from stagnant water. The value of irrigation, especially on meadow lands, to which it is so peculiarly applicable, can hardly be over-estimated; and it is a matter of surprise that it is not more generally resorted to, and every brook and rivulet turned to use, instead of being, as they now often are, allowed to run to waste, carrying off fertilizing qualities which might so easily be imparted to the soil.

Although most commonly applied to the growth of hay crops, meadow lands are, nevertheless, not unfrequently used for the grazing of cattle, for which the abundant herbage which they produce well fits them. They are especially valuable in this respect in dry summers, and during seasons of long-continued drought.

The Uplands, may be said to comprise all which is not included under the foregoing head—that is, the whole of the space from mountain ranges and hills of more or less elevation, to the low-lying and comparatively level grounds, which are known as meadow lands. Over such an extensive and varied surface, every variety of soil and capacity of production will of course be found. The more elevated tracts are generally used for the pasturage of sheep, and the other portions, not cultivated as arable lands, are applied to the grazing of cattle, or, in some instances where circumstances are suitable, to the growing of hay. This is more particularly the case, where the vicinity of a town presents a profitable market for the hay, and at the same time affords a ready supply of manure for the rénovation of the soil.

Of the hilly districts we shall hereafter speak;[*] and it may be sufficient here to remark, that it would be a great mistake to suppose that grass land, whether upland or meadow, does not require attention on the part of the farmer. Weeding is as necessary in grass as in arable lands, and if neglected, the consequence will be soon perceptible in the quality of the herbage.

If the dung dropped by the cattle is allowed to lie in heaps, it kills the grass and injures the pasture, but if it be knocked about and spread from time to time, it will serve to enrich the soil without injuring the herbage; or a better plan still would be, to collect and carry it to some convenient spot, and there form a compost heap, to be spread over the field at a proper time.

The urine of cattle is of the greatest use as a manure, and in keeping up the fertility of our pastures; for although in very dry weather it may sometimes injure the grass on the spot where it falls, its fertilizing qualities soon spread beyond this limit, and the first shower carries them to the whole of the surrounding surface. There is no kind of manure so immediately effective as urine, and the drainings of stables and cow and cattle sheds, when diluted and applied to the land, whether it be arable or pasture, meadow or upland.

Draining is as necessary to be attended to in grass as it is in arable lands; for unless excess of moisture is removed, the herbage will be neither sweet, nourishing, nor abundant. If rushes appear, or if other plants spring up which delight in moisture, no time should be lost in setting about draining the land, for until this is done it will be in vain to expect a good crop of grass, either for hay or pasture.

All lands are improved by enclosures judiciously arranged, and grass lands as much so as any, the shelter thereby afforded being of the greatest use in encouraging the growth of the herbage; whilst the changing of the cattle occasionally from one field to another, and thereby freshening the pasture, will enable the same extent of land to support a much larger quantity of stock than it would do if it was not divided by enclosures.

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[*] See Improvement of Cold Grass Land, p. 21.

Care must be taken to eradicate all noxious weeds and plants, such as thistles, docks, nettles, &c.; and to prevent the growth of furze, thorns, broom, or briars in the fields, which must be kept clear of rubbish of every kind. The fences must be regularly trimmed, and kept within bounds, so as to allow the fullest and freest space for the growth of the grasses, which alone constitute the food of your cattle.

If, owing to neglect and previous bad management, the land becomes infested with moss, that will not yield to draining and the application of lime (which however will very rarely be the case), it may be expedient to break it up, and put it through a regular course of tillage, until the whole of the old sward is destroyed; after which it may be again laid down in grasses of good quality, and will soon become equal to old pasture.

Composts of all kinds, constitute the best species of manure for grass lands. Street-sweepings, ashes, and other refuse from towns, the earth of old hedges, the scourings of ditches, road-scrapings, turf, chalk, sand, lime, marl, and stable-dung, each and all form valuable additions to the compost heap; and when thoroughly amalgamated, and spread upon the land, the mixture soon gets washed into the soil, nourishing and strengthening the roots of the grass. It is better, however, to apply a compost of this kind in moderate quantities every year, than to lay on a large quantity at one time at more distant periods; and, indeed, the same may be said of manures generally.

After the application of manure, the land should be bush-harrowed, and all stones, sticks, or other rubbish, be carefully picked off. If it be meadow, or if the field is intended for hay, it ought to be rolled with a heavy wooden roller, to consolidate and level the surface. This will improve the growth of the grass, and enable it to be cut closer, than if the process of rolling were to be omitted.

THE ARTIFICIAL GRASSES.

No farming can be well conducted, in which the artificial grasses are not cultivated; for without them there cannot be a proper rotation of crops, nor the requisite supply of manure for the land.

Clover and *Rye-grass* are the chief artificial grasses in use in British husbandry. They require the land to be in good condition, and are generally sown with the corn crop immediately following a fallow crop of turnips, potatoes, or mangel-wurzel.

In choosing clover seed, be careful that it is clean, and not mixed with other seeds, which may afterwards spring up and become troublesome weeds. The sorts of red, white, and yellow clover seed, may be easily distinguished from each other. The two latter are perennial pasture grasses, and the red clover is biennial, and grows tall and luxuriant.

Of rye-grass there are two sorts—the Italian, and the common perennial kind, and there is no certain mark by which they can be distinguished. The farmer ought therefore to purchase his seed from a respectable dealer, in order to guard against mistakes in this respect. When the ley is only intended to stand two or three years, the Italian rye-grass is preferable, from its giving a more abundant crop than the common variety; but the latter should chiefly be sown for permanent pasture.

When land is to be sown for permanent pasture, with white clover and rye-grass, the quantity of seed will vary a little, according to the condition and quality of the land, poor soil requiring most seed. White clover should only be sown in land intended for permanent pasture, for which it is well adapted; but it is wasteful to introduce it into alternate cultivation. The red clover is not adapted for permanent pasture, although in its proper place, and for soiling purposes, it is decidedly the best plant in alternate husbandry, and its growth cannot be too extensively encouraged. The yellow clover, or trefoil, is more permanent than the red, but not so much so as the white, neither is it so much relished by cattle.

Grass and clover seeds are occasionally sown with all sorts of grain crops, but they succeed best with barley. In high situations, where neither wheat nor barley prosper, they may be sown with oats. The state of the weather, of the ground, and the mode of sowing, all influence the successful vegetation of the crop. A rough uneven surface will require a greater quantity of seed than a finely pulverized soil. If the weather is wet at the time of rolling in the seeds, they will be apt to adhere to the roller. Calm weather should be selected, if possible, for the sowing of these seeds ; and the time of sowing must be regulated by that of the crops along with which they are sown, or any time in March, April, or May.

The white clover and common perennial rye-grass, judiciously intermixed and properly cultivated, will ever rank high as a nutritive and wholesome herbage. Through the agency of these grasses, extensive tracts of land have been converted into rich pasture, and the produce of the dairy has thereby been greatly augmented. Lime is the manure which has chiefly been used, and its application has improved the soil and adapted it to the habits of the plants, and the land has become progressively enriched. Indeed, in the improvement of waste land, and as a preparation for pasturage of white clover and rye-grass, the most liberal application of other manure will not always ensure their successful growth, without the application of lime.

Surface applications are now largely used around Edinburgh, for procuring crops of white clover and rye-grass. Soot is applied to a great extent, and has uniformly the effect of forwarding the crop. Liquid manures are also extensively used, and urine is collected with great care, for the purpose of being applied to the soil. Liquid manures are much more lasting in their effects than soot, and seem better adapted for clover. Saltpetre is likewise used occasionally, and forms an excellent top-dressing for seeding grasses. It is by the judicious use of such means as these, that the agriculturists of the Netherlands have been able to obtain abundant crops, and to keep up the fertility of their lands during so long a period.

When perennial grasses are fed or cropped very close in autumn, they do not rise with such a vigorous growth in spring, owing to the removal of that part of the stalk which would have afforded sap for the first nourishment of the grass; and even in spring, when the first shoots are fed very close, the grass does not again grow so vigorously, and is found to yield a considerably less produce during the season, than when it is allowed to attain a good growth before it is eaten, and then is not eaten too close.

IMPROVEMENT OF COLD GRASS LAND.

There is a large quantity of cold poor land in England and Scotland, and still more in Ireland, which at a moderate outlay might be brought under a profitable process of husbandry, either for arable or for grazing purposes, but more especially for the latter. Already much has been done in this respect, and with the best results; but much yet remains to be done, before the whole of such land will be brought into the state of productiveness of which it is capable. Lands of this description generally lie in bleak elevated situations, exposed to cold cutting winds. When situated above a certain elevation, land cannot be cultivated with advantage, the air at such heights being too thin, and destitute of the properties requisite for supporting vegetation with the necessary degree of vigour; and the finest soil, at such heights, is therefore unfitted for the purposes of tillage.

In the British islands, land may be said to be reclaimable for the purpose of cultivation, to the height of 800 or 1000 feet above the level of the sea; and for the improvement of land at this height, the first requisite is *shelter*, and the next is *drainage*. The land should be sheltered by fences and belts of plantation, and means should be provided for carrying off the rain-water, and any superabundant moisture which there may be in the soil. Both these preliminaries are absolutely essential, and unless these are attended to, such lands will be comparatively valueless, either for pasture or tillage.

Without a shelter for the animals which feed on the scanty herbage on elevated moorland tracts, the most hardy breeds can alone exist; but after fences and plantations have been formed, the severity of the exposure becomes tempered, and the cold of the naked hills is exchanged for comparative warmth and comfort. Plantations and enclosures have thus the effect of reducing, as it were, the elevation of a high and cold country; and whilst the animals are benefited, vegetation shoots forth more freely, and the herbage is rendered more nutritious.

The experience of every grazier confirms the fact, that sheep and cattle thrive better on sheltered lands, than on lands which are unenclosed, although the quality of both may be the same.

In the formation of belts of plantation, an occasional curvature will be found better than a long straight line: it affords more shelter; its outer front has less exposure to the wind; and it has, moreover, a more picturesque appearance. It is a great error in the formation of plantings for shelter, to make the belts very narrow: from sixty to a hundred yards wide will be found better than those of smaller dimensions.

The hedge-row enclosures of England have been sometimes condemned, as being too small for grain culture: this may be true in many cases, but their smallness is beneficial for grazing. The English graziers have found that five enclosures of ten acres each, will feed as many cattle as sixty acres within one fence.

After cold high-lying grass lands have been improved by planting and draining, the operations on the soil are next to be attended to. In general, the best application is a top-dressing of lime, which has a remarkable effect in destroying the coarse herbage, and raising in its place a sward of white clover, and other sweet grasses. But this is not the only benefit to be gained from top-dressing with lime. The thick matting of tenacious roots, which often keeps the soil in a state of sterility, is acted upon and decomposed by the lime, and formed into a fine vegetable mould, capable of supporting vegetation. Indeed, on all soils containing acids or ferruginous salts, lime is absolutely necessary to bring them into a state of fertility. Marl acts in a similar way, but it is less effective for the purpose than lime, and the same may be said of chalk, which, although very useful, is less effective than marl.

If lime, marl, or other calcareous substance is laid on the surface of cold grass land, the moss and other coarse plants will disappear, and a rich sward of clover, daisies, and meadow-grass will rise spontaneously; and from the results of numerous experiments, in many different situations, it is satisfactorily proved, that the owners of such lands, if within reach of lime, have only themselves to blame if the ground continues unprofitable.

In the application of lime to cold and newly-reclaimed land, which is generally surcharged with coarse vegetable matter, it should be a rule always to give abundance, and in a newly-slaked condition, in order that the lime may have its full effect. If slaked a considerable time before it is applied, it does not act so powerfully in reducing the noxious vegetable matter, or neutralizing the acids, as when applied in a hot state. On very thin moorish soils, however, lime by itself will not always improve the herbage. These soils require a nourishing, as well as a stimulating application; and a top-dressing of earth and lime, or even of good earth alone, will be found to have nearly the same beneficial effect that lime always produces on a stronger and deeper soil.

Top-dressing with clay, or sand, or a compost formed of each, will be advantageous in elevated moorish tracts, where lime or marl cannot be obtained. These materials are very effective in improving the pasturage, and destroying the growth of moss; and if applied in sufficient quantity, to the depth of an inch or so, they will generate a sweet herbage, and render the ground capable of being benefited by the droppings of the animals which it will then be able to support.

There are extensive ranges of elevated pasture land, producing in their natural state wholesome herbage, which are perhaps considered so good as not to require improvement; but no grounds will yield a better return than these for what is expended upon them, in top-dressing and drainage, by which the grass will be rendered sweeter, more nourishing, and more abundant. Surface-dressings of lime, marl, lime and earth, or lime and peat, will always be found extremely beneficial to the pasturage of these grounds. When good peat-mould can be procured, and properly mixed with lime, marl, or sea-sand, it will form a valuable top-dressing. A preparation of lime and peat is very conducive to the growth of clover, and the short sweet kinds of pasture-grasses; and by using it, the soil will acquire a tendency to promote the growth of such grasses, instead of rank, coarse, or sour herbage.

New peat-mould, if put into a heap by itself, will, in a short time, be reduced to a crumbling state, well adapted for top-dressing on thin cold or clay soils, especially if it has been saturated with urine from the cattle, or compounded with dung, marl, sand, or lime. Rushes, heath, bent, and other weeds entirely disappear, when a surface application of lime is given, or a compound of lime, marl, earth, or peat, provided that the soil is first properly drained.

IMPROVEMENT OF CHALK LAND.

There is a considerable extent of chalk land in the southern counties of England, now producing a very meagre scanty herbage for sheep, which might be made, under proper management, capable of yielding good crops. The precise mode of effecting the requisite improvement of such land, must of course in great measure depend upon the state of the surface, and on the depth and quality of the soil above the chalk; but the following directions will apply generally, and they may be modified at discretion according to circumstances in each case.

If the surface is old pasture, never tilled, or not tilled for a great number of years, the best mode of bringing it into tillage is to pare the turf as thin as possible in the autumn, and then to plough the land and expose it to the winter's frost, for the purpose of killing the insects and their ova, and so leaving it until the weeds have sprung into life in the spring, when it is to be folded with sheep. In May or June, according to the state of the weather, prepare the land for turnips, to be fed off the land at the usual time, and then in the following spring sow oats and seeds, and on the seeds lay a thick dressing of chalk after the oats are cut, in October and November. Feed off the seeds the year following, folding them with sheep, and then you may take a crop of wheat. On the wheat-stubble fold the sheep again, and then plough it up.

The thin-pared turf, having been placed in a compost heap, and mixed with whatever other manure could be collected, will by this time be fit to use with the ensuing crop of turnips; and the land will then be in a fair condition, and only require regular treatment.

In selecting chalk for manure, the pit should of course be opened as near to the land to which the chalk is to be applied as possible, and it may be either carted on, or carried from the pit on ponies or donkeys in panniers, having a bottom hung on a hinge to open for discharging the chalk; but care must be taken that the quality of the chalk is good. This may be ascertained by its effervescing briskly in vinegar, and melting or softening entirely therein. If it does not effervesce, or if it continues hard, or leaves much hard residuum, it is not fit for your purpose, and other chalk must be sought for.

If the surface-soil is of a tenacious clayey kind, no crop can be expected until the land has been well manured with good chalk. If the soil is thin and flinty, the application of chalk alone will not be sufficient, but as much farm-yard manure as can be spared must be given to it. If the land produces good crops after the second course is completed, it may be subsoiled with good effect.

If the surface is covered with furze, fern, or brushwood, and not with turf, the work of improvement must begin with digging (not trenching) the land, and sowing it with grass-seeds; and before any other crop is sown, a top-dressing of chalk should be applied. In the spring following, the folding of sheep must be in active operation on the land, and then a crop of turnips should be taken, all the other processes following, as before described. The brushwood, fern, furze, &c., collected from the surface, should be burned in May or June, and the ashes sown as a top-dressing with the turnips.

IMPROVEMENT OF CLAY LAND.

The mode of improving clay land scarcely admits of a brief explanation, for the clays vary so much in quality in different districts, and are so full of peculiarities, that portions even of the same field sometimes require to be treated differently. The great leading rules can therefore only be noticed here, leaving it to experience in each locality to govern the mode of their application.

The first object in the improvement of clay lands must be, to effect a perfect drainage of the soil, by carrying off the surface-water, and also the water held in suspension as it were in different strata in the clay, and which is derived from springs, that fill the land in their descent from adjoining heights.

After a complete drainage has been effected, the land should be subsoiled and exposed to a winter's frost, and a summer's sun to open its pores and meliorate its tenacity; and then it should be sown with tares, to be fed off by sheep folded thereon, as the weather and the state of the land may permit. The plough should follow the fold as quickly as possible, and a crop of wheat may then be taken. Lime, if it can be procured, will probably be the best dressing for the wheat crop; but sea-sand, peat-earth, ashes, or chalk, may answer, and the selection of the manure must be left in each case to the judgment of the farmer, according to local circumstances. A crop of turnips should follow the wheat, to be fed off by sheep, and then a crop of beans, to be followed by oats and seeds.

Great care ought to be taken not to tread clay land when it is wet, and every means should be adopted to keep its pores open, and to loosen and lighten its texture as much as possible. In very dry weather, however, care must be taken to keep the soil compact, an excess of brittleness being nearly as bad as an excess of tenacity in clay lands. With due attention and judicious management, such lands are capable of being rendered highly productive, and will well repay the labour and care bestowed upon them by the farmer.

RECLAIMING OF WASTE LAND.

If the land to be reclaimed is cold, wet, stony, or gravelly, with a shallow subsoil, as is frequently the case, it should be first trenched to the depth of 15 inches, keeping the better sorts of soil uppermost, and throwing the stones on the top. A less depth than 15 inches will not be sufficient—less has often been tried, and the land has turned out thin, poor, and springy, thus throwing away the outlay incurred, whilst an additional depth of four or five inches would have rendered the undertaking successful.

Any poor shallow soil, which may have been cultivated for years with little profit, will be greatly improved by breaking up and loosening the hard subsoil; and the reason of this is plain—the rain penetrates the earth until it arrives at the firm unbroken crust of subsoil which prevents its escaping, and the water being thus retained, it keeps all that is above it wet, cold, and unprofitable. The deeper, therefore, that this hard crust of subsoil is placed below the active soil, the better will be the yield; and hence it follows, that deep soils are always more productive than those which are shallow.

It is on this account necessary to cut through the hard stratum, commonly found at the bottom of the surface-soil of inferior lands, either by deep trenching, or by subsoil-ploughing. Where this is not effectually done, the farmer will have to complain of cold land and bad crops, and of the necessity of manuring more frequently than his neighbours; the cause of which is, that the hard crust of subsoil prevents the escape of the rain-water, and keeps the soil wet and cold; but if this crust were broken up, the land would become dry and fertile. Yet how many instances are there in which nothing has been done to break up the subsoil, and thus to give a greater depth for cultivation, although complaints are constantly made about the poverty and thinness of the soil.

When the land is trenched, the stones should lie upon the surface for a season, to consolidate the earth, and rot the turf that has been turned down. They should then be taken off; the smaller ones for under drains, and the larger may be used to make a fence round the field. If any of the stones are too large to be removed, they may be readily broken into pieces, by first digging around and under them, and then lighting a fire on the top, when there is wind enough to make it burn briskly, and blow away the ashes; by this means they will, in a short time, crack and fall to pieces. Large stones may be broken in this way, at small labour and expense. The land must afterwards be formed into regular ridges, 18 feet broad, with small furrows between each, so formed as to have a gradual fall, and that the surface-water may run gently off, without cutting and carrying away the soil.

In spring, the land thus prepared may be planted with potatoes, after which a compost of earth, peat, sand, lime, or marl may be laid on as a top-dressing, and it should then be sown with oats. The third year it may be dunged, and planted with potatoes again, or be sown with turnips or mangel-wurzel, followed by barley and grass-seeds, after which it may come into the regular rotation, and will be nearly as good as land originally of a more fertile character.

Bog, peat, or moss land, contains more vegetable matter than any other, and becomes highly productive when properly treated.

In reclaiming bog, and coarse wet broken land, the first object is to attend to the drainage and get rid of all superfluous water, after which you must bring the surface to a level, by throwing the rough heights into the holes and crooked water-courses, and forming the whole into ridges 18 feet in breadth, leaving a cut about a foot deep between the ridges, which must be slightly raised at the centres, to allow the surface-water to run off. If there is more of the rubbishy turf than is required for filling up the holes and hollows, it should be formed into heaps, and when dry, burned to ashes for manure. The black bog yields a large quantity of valuable ashes, and may be thus profitably burned: but the red bog is softer and more spongy, and yields scarcely any ashes, and these so light and volatile that the least breath of wind disperses them.

Paring and burning land is generally disapproved of by agriculturists, but with respect to bog and peaty soil, all the heath, fog, and coarse grasses, together with the surface, to the depth of five or six inches, may profitably be burned for manure. When burned, the ashes should be kept in heaps, and protected from the weather by a covering of sods, until it is regularly spread when the land is cropped.

Lime, marl, and sea-sand always improve bog, moss, and cold wet lands, by mingling with and decomposing the coarse sour vegetable matter with which such soils abound, and rendering the land more solid and productive: but no moss land can be considered thoroughly reclaimed, until it has had a coating of clay, gravel, loam, or some kind of earth, to the depth of from three to six inches, with a dressing of lime or sand, and until sufficient drainage has been provided to carry off the surplus moisture.

In spring, the land prepared as above may be planted with potatoes, dibbled in; and oats may be sown the following spring, with or without manure, according to the condition of the soil. The next crop should be turnips, potatoes, or mangel-wurzel, manured again with sand, marl, or lime, if possible; and then barley with grass-seeds, rolling it well afterwards. This will next year give a sward of grass, which, at the end of summer, may be cut for hay, or it may be pastured by sheep or calves, heavy cattle being kept off, as they would be apt to poach the ground. After two years' grass, oats may again be sown, followed by potatoes or turnips, manured; and the land will then be fit for any purpose, if kept free from water, and liberally supplied with manure.

In reclaiming any great extent of waste land, it ought to be divided into the number of fields best suited for the size of the farm, and the regular rotation of crops. The enclosures should all be square; for it has been found that in square fields, five ploughs will do as much work as six when the sides are irregular; and there is also less waste ground in the borders.

DRAINING.

Draining is one of the most important, as well as one of the most necessary operations in agriculture; and, when properly conducted, it is uniformly followed by beneficial results.

A certain indication of the want of draining in arable land, is where the crop grows strong on the summit of the ridges, but weak and thin at the sides, and little or none in the furrows. Whenever this is observed, no time should be lost in setting about draining the land, without which it will never produce good crops. No labour and expense in working and manuring the soil, can possibly yield a remunerative return to the farmer, until the land is relieved from the excess of moisture which these appearances indicate. Until this is done, the application of manure in any shape will be useless, for its fertilizing qualities will be immediately diluted and destroyed.

The effect is the same, whether the moisture arises from springs below, or from the atmosphere above; and the excess must in either case be removed by draining, before the land will be capable of yielding a due return for the labour and manure bestowed upon it.

If any springs appear, they must be kept from the surface by cutting an under-drain, of sufficient depth to intercept them, where the wet appears, and filling for

16 or 18 inches with small stones, over which a thin covering of turf or heath should be laid, to prevent the earth from getting in; and the drain must be then filled in and levelled, taking care to have 16 or 18 inches of earth above the stones, in order that the drain may not be disturbed in ploughing. This is the most common and durable sort of drain: but tiles and other materials are often used; and so long as a free outlet for the water is secured, leaving the surface dry for cultivation, it matters little how this is accomplished.

In some stiff wet clay lands, it has been the practice to drain with thorns, by cutting a narrow trench of the depth of about 3 feet, with a small groove or gutter at bottom, in which a rope of straw is laid from end to end of the drain, and over it the thorns are placed, and the trench is then filled in. This mode of draining costs but little, and will answer for several years, and in stiff clays perhaps affords a readier means of escape for the surface-water than tile draining: but where the land is once well tile-drained, it lasts for ever, whereas the thorns decay in 15 or 16 years, and the whole process will then have to be done anew.

In filling in the drains, however they may have been made, care should be taken to use the lighter portions of the earth thrown out in forming them, in order that the surface-water may pass more readily through it, and be carried off in the drain below. The heavier portions of the earth may be scattered over the surface, where it will soon become mellowed by the action of the atmosphere. This is especially necessary to be attended to in draining stiff clay lands.

There are other modes of draining practised in different parts of the country, each probably suited to the circumstances of the district, and effective for its object; for if a free outlet is provided for the spring and surface water, it matters little, except on the score of expense, how this object is accomplished, always presuming that at least 16 inches' depth of soil is left above the drain for the purposes of cultivation.

Care must likewise be taken to carry off the rain and surface water, by means of open drains, which should always be kept clean, and the outlets and water-courses must be scoured out as often as necessary, and always at least once a year.

If the surface-soil rests upon a shallow compact subsoil, the latter forms a kind of dam or reservoir for retaining the water, and the remedy in such case is, to cut through this obstruction, and thus to give the water a free passage to a lower level.

When water rests upon and overspreads the surface, the carrying it away in open channels is termed *surface-draining*. When water has penetrated the upper surface, but is unable to escape, being retained there by the tenacious subsoil, and kept soaking through, and rendering cold, wet, and unproductive all that is above it, the process of cutting through the obstruction, and collecting the water into a fixed channel, is called *under-draining*.

In the case of springs, the line where moisture appears on the sloping surface of a field, is generally perceptible, by the change of colour and other indications of wetness, as the production of rushes, coarse grasses, &c. By cutting a drain along the upper side of this line, sufficiently deep to intercept the water before it reaches the surface, it may be carried away to some convenient outlet. In such case, one drain well laid out, and of adequate dimensions, will often in this way effect a purpose which no multiplication of smaller drains could so cheaply and effectually accomplish.

The surface-water should be carried away in open drains. These consist of the ditches, which ought to be so made as to facilitate the escape of the water—the open furrows, which are formed by the ridges—and open trenches, cut in places necessary for giving the water a free passage. A good arrangement of ridges and furrows will generally of itself effect the purpose of surface-draining a field; but before the approach of winter, a few open drains, a foot wide and six inches deep, or more, according to the quantity of water expected, should be cut with a spade across the field, to catch surface-water, and carry it to the main drains. These water-furrows are easily made, and will well repay the trouble of making them.

All drains, as well open as covered, should have fall enough to let the water run off gently; but if the fall be too great, the stream will acquire so much force as to carry away the soil at the sides, which soon chokes up the drains. However formed, the drains should be conducted into a natural water-course, or else into a main drain communicating with one, so that the water may have a free outlet by which to escape.

Draining in all its branches is well deserving of the farmer's best attention; and a new kind, called Thorough-Draining, has been of late years much practised with the very best results. The mode of effecting this operation, to be followed by Subsoil-Ploughing, we will now describe.

THOROUGH-DRAINING, AND SUBSOIL-PLOUGHING.

These operations are independent of each other, and are performed at different periods, although the object of each is the same. They are both now extensively practised, and have invariably produced the most beneficial effects upon the soil, rendering it deeper and drier, and increasing the quantity and improving the quality of the crops.

Thorough-Draining.—Almost every description of land will be benefited by thorough-draining, but on wet heavy clays, and on soils having a hard retentive bottom, the effects are most striking. Land, which before grew nothing but sedges and the coarsest kind of grass, has been converted into a good mellow soil, and fitted for the culture of every description of crop, by means of thorough-draining.

The mode of proceeding to thorough-drain a field, is, in the first instance, to make a number of parallel drains, from 16 to 40 feet apart, according to the nature of the land, and as it is more or less exposed to wet, and either across or up and down the field, as circumstances may demand. If the land be low and wet, or if it consist of strong clay, the distance between the drains should not exceed 16 feet; if the subsoil is lighter and more porous, it may be 20, or 24, or 30 feet; and in very open subsoils the drains may be as much as 40 or 45 feet apart. When the ridges of a field are much raised, it will save cutting to run a drain up the furrow.

The drains must be 30 inches or 2½ feet deep, and be filled with rubble or broken stones to the height of 12 inches from the bottom of the drain, leaving 16 to 18 inches clear from the top of the stones to the surface of the soil. Cover the stones with a thin sod, overlapping it at the joints, to prevent any of the loose earth getting in. The drains are then to be filled in, and a crop of grain taken off the land, after which the subsoil-plough must be put in operation, working transversely across the direction of the drains.

This is the usual way of thorough-draining, but the drains may be formed with tiles, where they can be procured at a cheap rate, or with flat stones set triangular fashion, thus △, or one side perpendicular and the other angular, thus ◺, where suitable materials are at hand. In some cases shingle or large gravel may be obtained, or rubble-stones sufficiently small for filling the drains may be gathered off the land; but where large stones only can be obtained, these must be broken into tolerably small pieces (say two or two and a half inches square), in order that the water may filter readily through them. When tiles are used, they should have a flat tile or piece of slate placed at bottom, as a sole, to prevent the edges of the tile from cutting into the soil, and thus lessening or destroying the opening for the water. Circular tiles are sometimes used, and they appear to answer well; and in some places a tile formed somewhat like a horseshoe is used, having its thick ends bent back, so as to form a kind of feet for the tile to rest upon, thus Ω, which prevents its cutting into the soil, and supersedes the necessity for a sole.

A free passage for the water below the surface is the great object to be accomplished in thorough-draining; and this must be so done as to leave 16 or 18 inches of soil above the materials used for the formation of the drain, in order that it may not be disturbed by the plough. Keeping this object in view, the thorough-drainer can hardly go wrong with respect to the depth of the drain, or the materials of which it is formed; and if he has provided a suitable main drain, into which these subsidiary drains may discharge the water which they have collected, the land will be left dry, and fitted for the production of crops.

The main drain, into which all the other drains must be carried, should run along the lowest part or hollow of the land, and if possible should communicate with some natural water-course, by which the water it discharges may be carried off. Its size must depend on the quantity of water expected, but it should be at least 6 inches deeper than the other drains. Submains will often be necessary along the bottom of a field, to receive the water from the smaller drains, and carry it into the main drain; and these ought likewise to be made somewhat deeper than the others discharging into them.

The water thus collected, may often be most advantageously employed for the purposes of irrigation, and this should never be omitted wherever it is practicable. Brooks and rivulets constitute the natural drains of the country, and should in like manner be applied to irrigation, whenever the levels admit of this being done. Nothing can be worse than to allow streams to run to waste, which, if properly applied, are capable of imparting the highest fertility to the land.

As regards the space between the drains, it is obvious that this must depend upon local circumstances, some stiff wet lands requiring the drains to be placed close to each other, in order to secure a dry seedbed for the crops, whilst in lighter soils the drains may be placed wider apart. As a general rule, however, it may be said that the drains should be formed at from 5 to 15 yards, or from 15 to 45 feet apart, according to the nature of the soil, and other circumstances, of which the farmer must in each case be the judge.

Subsoil-Ploughing.—The land being thoroughly drained, the next step is to loosen and break up the inferior crust, and thus to obtain a greater depth of active soil, by means of the subsoil-plough. This implement is larger and heavier than the common plough, and is constructed without a mould-board.—It penetrates the soil to the depth of 16 inches, and although it effectually breaks up and opens the inferior crust or subsoil, none of it is brought to the surface.

The subsoil-plough is made as thin as is consistent with its necessary degree of strength, in order that it may pass through the soil with as little resistance as possible. From 4 to 6 horses, according to the nature of the land, are employed to draw it—these require care and temper, on the part of the ploughman, to bring them to take kindly to the work; and some dexterity is also required in the management of the plough itself, which, however, is easily acquired in practice.

As soon as the land has been cleared of the grain crop, the operation of subsoil-ploughing is to be commenced. A common plough goes first, turning up a furrow to the depth of from 6 to 9 inches, and the deeper the better; the subsoil-plough then follows in the same furrow, passing through the lower soil to a depth (including the first furrow) of 16 inches, breaking it up and loosening it; the common plough then comes round again, turning another furrow from the upper soil upon that which has been subsoiled, and is again followed by the subsoil-plough as before; and this process is continued until the whole of the field is subsoiled. If a subsoil-plough cannot be obtained, a common plough may be made to answer pretty well, by removing the mould-boards.

The drainage is so perfect after this process, that furrows are generally found to be unnecessary, as the surface-water readily passes through the soil, and sinks into the drains which have been prepared for that purpose, in the way above described. It is found that the subsoil never consolidates again, after being thus broken up; the constant circulation of the air, and the filtering of the water, keep it open and friable, and speedily fit it for affording nourishment to crops.

The ground which has been thus treated, may be ploughed to a greater depth, after a few years, and even to the full depth of 16 inches, if it is desired; and the subsoil, now become mellow and active, will thereby be mixed up and incorporated with the original surface-soil, freshening and strengthening it, and crops of unusual excellence, both in quantity and quality, will be obtained from the land.

The harvest will, moreover, be considerably earlier than on the same land in its previous state, in consequence of the greater dryness and warmth of the soil: whilst the increased depth of the soil, will enable it to absorb and retain sufficient moisture for the nourishment of vegetation; and this moisture will be given back precisely as it is required, under the influence of the sun's attraction, for the nourishment of the crops.

Draining in all its branches, and in all situations, is so important, and so obviously essential to success, that the farmer who has the means of effecting this operation, and possesses an undrained rood of land, deserves to be poor, and to be pointed at by his neighbours as an idle and improvident person.

IRRIGATION.

Irrigation, or the watering of land, is a process by which, with little trouble or expense, large crops of hay and luxuriant pasturage may almost always be ensured. It is difficult to account for the very general neglect of irrigation, in situations where it might be adopted with so much advantage by the farmer. Meadows in which only coarse or scanty herbage now appears, might easily, by watering, be rendered highly valuable and productive.

The use of running water on the surface has been practised, for promoting the growth of grass, from the earliest ages all over the East, and seems to have been known in some parts of England in the time of the Romans.

Irrigation acts as a means of giving food to grasses

—of consolidating boggy and mossy lands—as a destroyer of certain kinds of weeds—and as the cause of warmth in winter, and of coolness in summer. The banks of streams which are occasionally flooded, are found to yield the richest grass. The tender roots and leaves of grass, covered in winter or in the beginning of spring by water, are protected from frost; and there is no soil, situation, or climate in which watering grass land is not serviceable. One preliminary, however, is always and everywhere necessary—*the land must be effectually drained.*

Chalk, or sandy and gravelly soils, are best suited for irrigation, the effect upon them being more markedly beneficial and immediate than upon cold clay soils; but every description of soil is benefited thereby. Land may, by proper irrigation, be kept in a state of perpetual fertility without manure; and comparatively poor land will thereby be rendered capable of yielding a large bulk of hay, and abundance of the best grass, often early in the spring, when it is doubly valuable. The finest water meadows on the Avon, in Wiltshire, where the richest herbage is found, have scarcely any soil, but chiefly consist of a bed of shingly pebbles and gravel, matted together by the roots of the grass, which is nourished by irrigation with the water of the river.

When there is a considerable fall, and a sufficient supply of water, a series of channels may be formed, at levels below each other, so that the second shall collect the water supplied by the first, and distribute it over the space between it and the third; and so on, till the fall is lost, or the water exhausted. Winter and spring are the time for irrigating. The mode of doing this, is to keep water passing over the surface of the land with a gentle current, not so rapid as to wash away the soil; and it should be in sufficient quantity to cover and nourish the roots, but yet not so much as to hide the tops of the grass.

The advantages of irrigation consist principally in conveying oxygen to the roots of the plants, and this is obtained from the water of rivers and streams, which holds oxygen in solution. The quantity of water need not be great, so that it is sufficient to cover the surface, and if it be frequently renewed. A meadow is not to be converted into a marsh by being covered for several months with stagnant water; but is to be fertilized by passing a gentle current over it for short periods, and with occasional intermissions.

A little experience as to regulating the quantity of water, and length of time for flooding, is all that is required in ordinary cases. A very small stream, if it has a considerable fall, may be carried over a great extent of ground, and be used successively several times; but good management will be required in order to make the most of it, if the stream be very small. Losing fall is, in such case, a wasting of the stream.

The process of watering generally commences in the month of October, when the aftergrass has been consumed, or the second crop of hay removed. The water is kept on the ground for periods of a fortnight or three weeks at a time; it is then let off, and the ground laid dry for five or six days. This process of alternately flooding and drying, is generally continued during the months of November, December, and January, care being taken to let off the water when it begins to freeze hard. As the spring advances, and the grasses shoot up, the periods of watering are shortened, so that the flooding shall not last more than five or six days at a time.

In the southern counties of England, the meadows, after being irrigated, will be ready for the stock about the end of March; but in the more northern districts, where vegetation does not make such early progress, the flooding is continued till the month of May, after which a crop of hay, and sometimes two, are produced.

Wherever the levels are favourable, a great extent of land may be easily and cheaply improved by irrigation; and every spring and rivulet might be thus turned to important use, fertilizing a smaller or larger surface, in proportion to its magnitude. The water obtained in draining the land might also, in many instances, be applied to the purposes of irrigation; and thus a double advantage would be gained, first by relieving the soil from an excess of moisture which was injurious, and then by converting the water so obtained into a means of fertilizing the land.

BURNING OF LAND.

The burning of land is a pernicious mode of preparing it for crops, much practised in Ireland, especially in the western districts; but good dry land should never be burned, as it dissipates the finer portions of the soil, and reduces to ashes, of little comparative efficacy for the production of one crop, fertilizing matter, which might, by other management, be made effective for the support of many crops.

Burning may nevertheless not be always and in every case inexpedient, for the most effective mode of destroying weeds and coarse herbage on cold, wet, and boggy land is unquestionably by the use of fire. If burning was only practised by those who would return to the ground in the shape of manure, as much as had thus been taken from it, little comparative injury would be done: but the wrong which land sustains by burning is, the having the rich vegetable mould of its surface consumed, without any compensation whatever being returned to it; and it is thus left, after the first stimulating effects have subsided, in a state of complete exhaustion, and incapable of yielding nourishment to any description of crop.

The burning of coarse boggy lands, and wet rushy moors, is often the best and cheapest mode of reclaiming such ground. The process of fire on lands of this description, immediately destroys the coarse weeds and herbage, and by converting them into stimulating manure, forces a heavy crop. This will not, however, be the case, unless the land be previously well drained; and it is by omitting this essential preliminary, that much valuable labour is often lost, in the efforts made to bring such lands into cultivation.

Wherever burning is resorted to in the reclaiming of cold wet lands, let the ashes be equally spread, and turned in hot. Then take a crop of turnips, or rape, to be eaten upon the ground by sheep; after which sow grass-seeds, with either barley or oats, and pasture these with sheep. If the land is broken up again in two or three years, a crop of oats may be taken, and the straw converted into manure, and applied to the ground preparatory to a green crop. This process will generally serve to put the land into good condition, as well as prove remunerating to the farmer.

MANURES.

Our fields might be kept in a constant state of fertility, by replacing every year as much as we remove from them in the form of produce; but by repeated cropping, the best soils will become exhausted, and require the application of manure, before they will yield a return to the labours of the husbandman.

Manures are of two classes,—putrescent, and fossil or calcareous. The first, consisting of animal and vegetable decomposing matter, is chiefly beneficial in feeding the plant; the other operates chiefly as a stimulant upon the soil. The first kind includes every description of animal and vegetable manure, and in the second class are ranked lime, marl, gypsum, sea-sand, and clay.

Animal and vegetable manures are putrescent in their nature, and consist of certain elementary parts of animal and vegetable substances. Every constituent of the body of man and animals is derived from plants, and the dung of all animals is no other than the remains of the vegetable or animal food which has been received into the stomach.

From the constant decay of organized matter, and its conversion into fluids and gases, it may be inferred that animal and vegetable substances, and excrementitious matter, are only different modifications of the same original principles. The active elements of them all are hydrogen, carbon, and oxygen, in some cases united with nitrogen. Conveyed by liquids or moist substances into the ground, these agents act as a nourishment to plants, and so form the principles of a new vegetation. As flesh consists of a greater concentration of these elements than vegetables, the manure produced by carnivorous animals (man included) is more powerful in proportion to its bulk, than that of animals which live upon herbage alone.

The value of urine as a manure has long been known to farmers on the Continent, and especially in Switzerland and Flanders, where it is collected with the greatest care; and the Chinese, who are the oldest agricultural people we know, set so high a value upon human excrement for the purpose of manure, that laws are made to regulate its collection, and prevent its being thrown away. One quart of the urine of a man is considered equal in its fertilizing qualities, to six quarts of the urine of a cow, and to thirteen quarts of that of a horse. It hence appears how important it is to agriculture, that human urine should not be lost. For the most part only the solid excrements are used as manure in this country, but these contain the insoluble matters, whilst the urine contains the soluble salts and phosphates which existed in the plants at the time they were consumed by the animals, and which are necessary to vegetation.

Neither animal nor vegetable manures are practically of any use, until the active agents which they contain are disengaged by putrefaction. If the animal or vegetable substance does not decay or putrefy, it is of no more use than a stone. A piece of peat, for instance, is an inert vegetable mass, preserved from putrefaction by water, and certain antiseptic qualities in its substance. In this condition, it is valueless as a manure; but when we expose it to the atmosphere, and thus bring on decomposition, its character is changed, and we have a highly nutritious manure.

In the process of putrefaction, the elementary particles are set at liberty, in a fluid or volatile state. If stable dung be piled into a heap, and exposed to the weather, it soon becomes heated, and emits a vapour, composed of the escaping gases. The heap is seen constantly diminishing in weight and bulk; and at the end of six months, if there have been alternate moisture and warmth, not above a fourth of the original matter will remain to be spread on the field;—the real manure is gone, and what remains is little better than a mass of rubbish.

No subject connected with agriculture is more important, or so little understood and attended to, as that of manure. Generally speaking, the excrementitious matters are thrown on the dunghill, and left to the effects of exposure and drainage. This is a gross abuse in farming, which cannot be too speedily remedied. The putrescent steam which escapes as fermentation advances, contains the very essence of the manure, and should either be confined with the dung, or be conveyed to fresh vegetable or earthy matter, to impart to it its nutritive qualities. The attention of the farmer cannot be too carefully bestowed upon the means of preventing, as far as possible, the loss by evaporation of these active and most useful particles of his manure.

The earth readily absorbs all the gases which arise from putrefaction. A strongly-dunged field, after being ploughed and harrowed, sends forth a healthful and refreshing smell—a proof that all the putrid vapours are absorbed, for the nutrition of the crop. The poorest earth may be enriched in a high degree, by mere exposure to the gases generated by putrefaction. Put a layer of common earth, twelve or eighteen inches thick, on the top of a fermenting dung-heap, and allow it to remain there while the fermenting process is actively going on: when afterwards removed from the heap, you will find that the earth has become impregnated with the fertilizing qualities of the dung.

A knowledge of this important truth has led to the practice of making compost dung-heaps, in which the valuable liquids and gases of different kinds of manure are absorbed by earth, sand, ashes, peat-mould, and other substances, and the whole is thereby brought into the condition of an active and highly valuable manure for the land.

Hitherto, it has been customary to speak of dung-heaps or dunghills, but there ought to be no such thing as a dung*hill*. The manure from the farm-yard and offices should be collected into a dung-*pit*; and the manner of managing the contents of this pit, is well worthy of the farmer's best attention. Nothing can be worse than the practice now usually pursued in this respect. The dunghill is generally raised like a mound, so that all the moisture flows away; and fertilizing matter of every kind may be seen running to waste, instead of being kept together in a proper receptacle, to enrich the land.

One of the first objects should be, to form a proper receptacle for the manure, and refuse and drainings of every sort, from the house, stable, pigsty, and yard. It should be made deep and large enough to contain all the moisture arising from the manure, or that may drain into it from the cow-house and stables, &c. The bottom must be puddled with clay, or earth beaten or trodden down very hard, to retain every drop of this moisture, and it should also be paved with stone. The influx of too much surface-water ought likewise to be prevented.

A layer, about six inches in depth, of turf-mould, clay, earth, sand, or ashes, should be first placed in the bottom, and above it the stable and yard dung. To that should be added refuse vegetables from the house, road-scrapings, ditch-scourings, sea-weed (if it can be obtained), entrails and bones of fish, all dead animals, cow and horse dung collected from the roads and fields, potato-stalks, and weeds and rubbish of all kinds from the garden. These would form valuable additions to the dung-pit, which ought to have layers of soil added to it from time to time to absorb the moisture, and prevent loss by evaporation: but the pit should be so formed, that the manure may never rise more than a foot or two above the top, else some of the juices may run off and be wasted.

If the manure appear rich, layers of earth, turf-mould, ashes, clay, &c. may continue to be added, as at first, care being taken that none of the moisture is allowed to escape or be lost. Should any flow over, it must be collected in another pit, formed close to the first, and at a somewhat lower level; whence the liquid may be taken up, and again poured over the dung, or else be applied at once to the manuring of the land, as may be deemed expedient. Every drop of this draining is valuable, and no part of it should be allowed to run to waste.

In large farms, where many cows and other cattle are kept, a mere pit, of the kind above described, will not be sufficient for the manure which will be made; but the same principle should be applied, and the juices be preserved, and loss by evaporation as far as possible be prevented. The dung-yard should be hollowed out in the centre, as deep as it can be done conveniently, and be puddled and paved at bottom to retain the moisture; and tanks or reservoirs should be formed, into which the urine of the cattle may drain and be preserved for use.

In the best farming establishments, the liquid manure is thus collected and retained in tanks, and then pumped out into large casks and carted to the fields which most require it. In Switzerland, all the urine and dirty water of the household, of every kind, is carefully kept in tubs by the farmers, and carried to the compost heaps, or to the fields, as they find necessary; and in China the utmost attention is paid to such matters, and we are told that the very soapsuds used in shaving, are there taken care of and sold for manure.

No farmer, great or small, ought to be without a tank or receptacle for liquid manure, which is especially profitable for grass land, and always increases the crop of hay. In Holland, immense crops of rape are raised from land chiefly manured with the urine of cattle, with rape-cake dissolved in it: tanks are constructed under their stables and cow-houses for receiving it, and it is more highly esteemed for the light lands than any other kind of manure. A barrel or large tub, sunk in the ground, will for a time, and as a makeshift, serve the purpose of a tank; and as the vessel becomes full, its contents may either be thrown over the manure, or mixed up with earth, ashes, or other substances; or it may at once be applied, mixed with water, to grass lands, turnips, mangel-wurzel, or other crops, on which it never fails to produce the most salutary effects. By mixing urine with an equal quantity of water, its fertilizing powers are materially increased.

In Holland, and in Belgium, the system here described is invariably followed, whatever the size of the farm may be; and the comfort enjoyed by the agricultural population of these countries, is in a great measure owing to their careful attention to those minute, and often apparently trifling matters, upon which, in fact, success in everything so much depends.

In forming the layers of compost in the dung-pit, care should be taken to select such materials as will be most suitable to the soil intended to be manured. If the land is strong and clayey, add ashes, or sand, to render it less adhesive. If it be thin and gravelly, clay will be most serviceable.

Straw is the chief ingredient of farm-yard dung, and it should be collected and managed with care, the fertility of your fields depending in a great degree upon the way in which this is done. Every ton of straw, if rightly managed, will yield three tons of manure. An acre of turnips consumed by the cattle, giving them at the same time a suitable quantity of straw, will produce from ten to fifteen loads of good manure; and if due care be likewise taken to collect the road-scrapings, weeds, and refuse of every kind on the farm, there will be sufficient for well manuring the land once in every four years, taking the courses in succession.

When there is an opportunity of getting sea-weed, it ought to be collected, and, if not immediately ploughed in, it should be formed into compost with the dung from your pit, and sand, mould, or ashes, and allowed to heat in the heap; but care must be taken that, in case of becoming too hot, the fermentation is stopped, which may be effected by covering the whole with a coating of earth. Indeed, all the dung ought to be so covered occasionally; for whenever the manure is seen smoking it is losing in value, and earth thrown over it imbibes the evaporating gas, and becomes enriched thereby.

Exposure to the air always injures manure; and when carried to the field it ought not to be allowed to stand open for any time, but it should be immediately covered in, and the juices saved from evaporation. What is dropped, or allowed to lie open in the fields, becomes in a short time, from the effects of sun and rain, comparatively valueless. Thus the dung and litter from your cows, if milked in the field, should be collected and carried home, or else be gathered into heaps and kept covered till wanted.

Every animal contributes towards its own support, by producing manure for succeeding crops, and it is the farmer's duty to take care that this provision of nature is not wasted. Housing your cattle at all seasons, not only ensures a supply of valuable manure for your land, but also secures a better produce and better health for the animals. There can be no doubt on this point, and it would be well if our milking-cows were everywhere grassed as little as those of a London dairyman, or a Dutch or Belgian farmer. The manure collected in summer from green food, and when the animals are in high condition, is much superior to that produced by the lean and ill-fed cattle of winter.

There are a great variety of substances, besides farm-yard manure, which promote vegetation, and are valuable to the farmer according to the facility with which they can be procured, and their suitableness to different soils. Coal, wood, and turf ashes, burnt clay, soot, gypsum, salt, malt-dust, &c., improve grass lands, especially if inclined to moss, or if the herbage is of a coarse or bad quality. Gypsum, salt, and malt-dust, must be used at first sparingly, as they are great stimulants, and would injure vegetation if laid on too freely; but a few trials would show the quantity necessary on different soils. Soap-boiler's shavings is a most valuable article for top-dressing, especially on cold land. Oyster and other shells, furriers' clippings, horn shavings, woollen rags, &c., have all their respective fertilizing properties, and should be sought after by every farmer who is anxious to make the most of his land.

The substances which have been withdrawn from the soil, in the crops which it has produced for the use of man and animals, must be restored to it in some shape, before it can again yield a like produce.

The vineyards on the Rhine used to be manured annually, at a great expense, in order to keep up their fertility; but of late years it has been discovered that the prunings of the vines in July and August, afford the readiest and best means of restoring to the soil the fertilizing matter which had been withdrawn from it, in the growth and nourishment of the plant. The branches of the vines, immediately they are pruned, are now cut into small pieces and mingled with the soil, and their decomposition is so soon effected, that at the end of a few weeks, no traces of them can be found. The fertility of a vineyard may thus be secured for almost an indefinite period, with little or no application of manure, excepting that which is obtained from the vines themselves; and the same would doubtless be the case with currant and gooseberry bushes, and with vegetable productions generally, if the leaves, branches, and refuse were restored to the soil in the way now practised in the vineyards bordering on the Rhine.

Provided the fertilizing matter which has been abstracted from the soil in the growth of the crop, is again restored to it, it is perhaps not very material how the restoration is accomplished: and it has been said, by a high authority, that "a time may come when fields will be manured with a solution of glass (silicate of potash), with the ashes of burnt straw, and with salts of phosphoric acid, prepared in chemical manufactories, exactly as at present medicines are given for fever and goître."*

The foregoing observations apply to manures generally—a subject of vast importance to the farmer, whose success will in a great measure depend on the manner in which he collects and applies these fertilizing substances. We will now more particularly describe a few of the chief of them, and at the same time suggest the best mode of applying them to the land.

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* Professor Liebig.

Lime, is considered the most valuable of the fossil manures, and for cold mossy soils it is indispensable. It may be obtained in most situations, and should be covered from wet, and not slaked till laid upon the land. It must then be regularly spread, and immediately harrowed in with the seed, but not too deeply, for lime ought to be kept near the surface. Lime is also extremely useful as a compost, and as a top-dressing for grass land; but it is comparatively useless, if laid on wet undrained land. The quantity used must depend upon the nature of the soil; for whilst 80 bushels per acre is sufficient for sandy soils, loams will require 100, and clay 150 bushels per statute acre.

Quick-lime decomposes any hard vegetable substance in the soil, and converts it into food for the cultivated plants; and hence its value when applied to mossy land. It improves a soil destitute of calcareous matter. It separates the particles of stiff soils, making them more friable, and acts upon light soils, by making them more firm and adhesive, thus rendering both soils better adapted for the growth of plants.

The benefit to be derived from lime, greatly depends, however, upon the nature and the state of the soil. Strong lands are much improved for two or three crops by this stimulant, but frequent repetitions will not have the same good effect, unless the land in the interim has been placed under a clover or other green crop, by which vegetable matter will be introduced for the lime to act upon.

The deficiency of vegetable matter in light soils, is one chief reason why lime does not always act upon them beneficially; and it should therefore be used very sparingly on these soils, with an interval of six or seven years between each liming. Indeed, it is often as necessary to change the mode of manuring land, as it is to change the crops to be cultivated; and it is from not sufficiently attending to this, that arable farms have become deteriorated, whilst the farmer fancied that he was doing great justice to the land by liming every third or fourth year. But let the introduction of a green crop be tried in such a case, and the farmer will afterwards find his crops of corn increase, and his land in better heart.

On the first application of lime to land abounding in vegetable matter, it should be laid on in a hot state. Its effects when so applied will continue, so long as it finds vegetable matter to act upon; but when lime is applied to land constantly in tillage, it has little or no vegetable matter to act upon, and therefore can have comparatively but little effect. On the cold peaty lands in Derbyshire, they lay on as much as two inches thick of lime in the spring, which by the end of summer completely decomposes the coarse grasses, and brings up an excellent herbage; but lime in such quantity would destroy vegetation, if applied on thin soils, or worn-out fallows.

Some persons think, from witnessing its first effects, that they can always have recourse to lime with the same success; but in this they will assuredly be disappointed: once in five, six, or seven years, according to the nature of the land, is as often as lime can be applied with advantage.

Experience proves, that if lime be frequently used, it must be applied as manure, and not singly as a stimulant; and to this end, it must be compounded with earth, clay, and other matter, to which it communicates its stimulating qualities, whilst its fertilizing effects are thereby augmented. In this state it will act powerfully as a manure, and be a valuable auxiliary in the hands of the farmer.

Most varieties of subsoil strata make good compounds with lime. Sand and lime, with peat or turf, if it can be obtained, should be mixed for a clay soil; and subsoil clay and lime, for sands, gravels, loams, and peaty lands. No farmer need complain of want of materials to make fertilizing compounds, since every sort of soil may be used for this purpose; and not only is immediate fertility produced thereby, but there are few districts in the kingdom, however barren, that may not be improved, or brought into a fertile state, by dressing with a well-proportioned mixture of earth, clay, sand, and lime. Care should be taken, however, to proportion the quantity of lime according as the land is light or heavy, cold or warm. Light soils have been hurt by too abundant applications of lime; and while one part of lime to from six to ten parts of earth may do for light soils, one part of lime to two, three, or more parts of earth, will be required for heavy soils.

The application of lime alone to land long under tillage, is often found not to be beneficial; but if the same quantity of lime had been applied in a compound state, with sand, turf, earth, clay, or vegetable mould, good effects would have resulted. On deep loams, lime may be applied in a caustic state, more frequently than to most other soils; but the testimony of experience is in favour of its being used in a compound state.

Marl, is a calcareous earth, and is very fertilizing, especially when used as a top-dressing. It is often found at the bottom of ponds and lakes, and also in strata at a considerable depth below the surface, and sometimes in immense masses, almost amounting to mines or quarries. It well repays the labour of collecting, and may be applied at all seasons of the year, and in almost any quantity.

Marl, like lime, is a powerful stimulant; and if not judiciously applied, and with intermediate applications of farm-yard or other putrescent manure, it will not be always beneficial to the land. It is found of different colours, and possessing different properties, according to the substances of which it is compounded.

Clayey marl is well suited to light sandy soils, which it improves and renders solid. To such soil it can hardly be applied in too great a quantity; as much as 130 loads may be laid on to the acre. Sandy marl is good for all stiff soils, rendering them friable and more easily worked. Shelly marl, as its name imports, is the product of shell-fish, and is highly fertilizing upon soils of every description. Its effects are not so quick as lime, but they are more lasting.

Marl and clay are sometimes mistaken for each other, being often very similar in their appearance and qualities. If clay has any considerable admixture of lime, it may almost be called marl; and either the one or the other may always be applied to light soils with advantage.

In some counties marl is very abundant, and of the best quality, and it is much used on the grass lands, being carted on early in the spring, or late in the autumn, and allowed to remain on the surface till it is decomposed. The strength and quality of marl may be ascertained by immersing a small lump, previously dried, in a cup of vinegar, and if it effervesces strongly, it may be considered good.

Gypsum, is a calcareous substance, which has long been used as a manure, and is held in high estimation by the agriculturists in Germany. Like lime and marl, it requires to be applied with discretion, and with alternations of other manures. Without attention in this respect, it will not always succeed. It has generally been found more useful when applied to clover, sainfoin, and the grasses, than in the cultivation of corn, or turnips and other green crops.

The soils upon which gypsum operates most beneficially, are the light dry sandy and gravelly sorts. On heavy loams, and strong clays, it appears to be of little use. Gypsum being itself calcareous, it would seem to follow that it should not be applied to soils of that nature; but experience has proved that it may be advantageously applied to chalky and limestone soils. Upon land which has been exhausted by cropping, and which contains little vegetable matter, it will prove of little or no avail; but it will do good after an application of farm-yard dung, or of a green crop ploughed down.

Five bushels to the acre, is considered a sufficient dressing for red clover and the grasses; and it should be applied in dry weather, for if the weather be rainy, its effects will be lessened, if not altogether destroyed.

Chalk, in its general qualities, is very similar to lime and marl, and may be used much in the same way. It is highly useful upon stiff clays, which can hardly have too much of it; and it may be applied with advantage to grass lands, especially to meadows, wherever it can be obtained conveniently.

Chalk exists in great quantities in some parts of England, and is much used as a manure; but, like other calcareous manure, it requires that there should be vegetable or animal matter in the soil for it to act upon, without which its fertilizing qualities are comparatively powerless.

Sea-sand forms a very valuable manure, wherever it can be obtained, as it may be abundantly in some situations. Its quality, however, is not everywhere the same; but that which most abounds in shells, is the most valuable.

Sea-sand is useful in all sorts of soils, and it may be laid on at all seasons of the year; but, like lime, it requires to be kept as much at the surface as possible, it being apt to sink deep in the earth. Sand is particularly valuable for clay lands, rendering them less stiff and adhesive, at the same time that it increases their fertility. Sand may also be used with advantage in all the compounds, and adds greatly to the value of the compost heap. In whatever way it is applied, it will in fact be found beneficial, unless the soil be of a loose and sandy nature, requiring clay or adhesive applications.

It is obvious that the sooner sand is applied to the land, or to the compost heap, the better will it be. When carted directly from the shore, it contains a portion of sea-salt, which is itself valuable as a manure, but which is lost if the sand be allowed to lie exposed to the action of the weather for any considerable time, as is often the case. The farmers on the coast, having an abundance of the article, are too apt to be heedless and wasteful in its collection and application. It is often carried to a considerable distance inland, and wherever attainable it should never be neglected.

Sea-weed, constitutes a valuable manure. It produces good crops of potatoes and vegetables of all kinds, particularly cabbages; but it is not lasting in its effects on the soil, owing to the large quantity of water which it contains, and which goes off in evaporation. It decays without producing heat when exposed to the air, and seems to dry up or dissolve away. A large heap has disappeared in less than two years, leaving nothing but a little black shrivelled fibre. Probably one of the best ways of using sea-weed, is to plough it into stubble, as fresh as possible. By so doing, the labour of collecting, mixing, and carting out composts is avoided; and the stubble straw, instead of withering away unprofitably, is covered in with the sea-weed, and is immediately converted into a valuable manure.

The acrid and astringent qualities of sea-weed are, however, sometimes found to be injurious, if used by itself for a long continuance; but this is not the case where it is formed into a compost with earth, sand, ashes, clay, or other substances, and turned over and mellowed before being applied to the land. Such mixing of materials would seem, indeed, to be generally the best mode in which manures of all kinds can be used; and the compost so formed, is alike suitable for grass and tillage land.

Ashes, are a good manure for potatoes or turnips. On cold, boggy, and heathy lands, in which there is an excess of coarse herbage, burning may often be resorted to with advantage. The objection to burning is, that it destroys the surface-soil; but where there is a superabundance of vegetable matter, as in bogs, the destruction of a portion of it by fire is beneficial; and the alkali which exists in the ashes, will constitute a useful stimulant to the growth of crops.

Cold, boggy, and heathy land, not worth 2*s*. an acre in its natural state, by once burning the surface, and afterwards liming or manuring with dung, has been rendered highly valuable and productive. It is against the abuse of this practice that you are to guard: but moors and stiff soils may often be improved by burning, after the land has been properly drained; and these joint operations will rarely fail of converting what was stiff, damp, and cold, into a soil mellow, dry, and warm.

Burnt Clay.—The ashes obtained by burning clay, have long been used as a manure on heavy lands in some districts of England, and with considerable advantage, the ashes thus applied serving to lighten and mellow the soil for six or seven years afterwards. The work of burning usually begins in May, and continues through the summer, in heaps of from fifty to one hundred cubic yards * each. Brushwood and faggots are mostly used, but sometimes coal where it is cheap. The quantity required of either is however not great, if the work is properly performed.

The clay to be burned is not the upper and better portion of the soil, but the colder and closer kinds, dug out of any pit at any depth below the surface, together with the scouring of ditches and rubbish of every description. The walls or outside of the heap are usually formed of turf, within which the clods and lumps of clay are placed, so that the fire may draw gently through them in burning. If piled up too loosely, the draught will be too strong, and the burning too rapid; if too closely piled, there will not be draught sufficient. The slower the burning proceeds the better, provided that the clay is effectually burnt and pulverized.

The heaps must be attended to night and day whilst burning, to prevent the fires going out, or burning too fiercely, in which case the clay becomes burnt to a kind of brick, and is then perfectly useless. When the burning is rightly managed, the clay is converted into a blackish kind of ashes, and this is the thing to be aimed at.

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* A cubic yard is generally considered as equivalent to a cart-load.

The quantity of the ashes to be applied to arable lands is from forty to fifty loads to the acre, and on grass lands from twenty to thirty loads per acre. The ashes are usually carted on after harvest upon clover leys, stubbles, or fallows. Upon grass lands they may be laid on at any time most convenient.

Burnt clay may be used to form a compost with earth, sand, marl, or other manures; and in this way it will be found highly beneficial as a top-dressing, and in lightening the texture and improving the condition of stiff heavy lands.

Bones, constitute a manure, than which none can be more advantageously employed for raising turnips. When broken or ground into dust and drill, and used in equal proportions, it ensures an early and weighty crop. From twenty-five to thirty bushels per statute acre, is the quantity usually required for drill-sowing, which is generally, if not always, to be preferred to broadcast.

Bone manure is at once stimulating and nutritive, and very durable in its effects. When broken into pieces of about an inch in size, it will be three or four years before these are entirely decomposed in the soil; and they will continue to throw off coats of calcareous matter promoting vegetation. When the bones are bruised, or broken small, or ground into powder, the effect is of course more immediate.

The finest vetches, and a crop of wheat afterwards, have been produced from a dressing of bruised bones of twenty-five bushels to the acre. It is, as before stated, an excellent manure for a turnip crop. It may be laid on and covered in at the last ploughing, whether the turnip-seed be drilled or sown broadcast, though the drill is always to be preferred. It is well suited to dry land and light sandy soil, and is also extremely beneficial to grass land, when the bones are bruised small, or reduced to powder.

If the turnip-crop raised with bone manure be not eaten off by sheep, the land will require to be manured when sown in spring; but if it be sheep fed, it will be fit for a grain crop without manure.

Rape Dust, *Meal Dust*, and *Malt Dust*, are each of them highly fertilizing manures. They are very stimulating, as well as nutritious, and for that reason are especially beneficial in turnip culture. Their portability, moreover, often renders these manures of great convenience and value to the farmer. From fifteen to twenty cwt. of either is sufficient for an acre. Rape dust drilled with autumn-sown wheat, at the rate of four to five cwt. per acre, has been found to answer well, and give an abundant crop.

Guano, is a substance which has been recently imported and used as a manure. It is composed of the excrements of the sea-fowl which frequent the islands on the coast of Chili and Peru, and is admirably fitted for use as manure, as it contains ammoniacal salts in great abundance, as well as other constituents essential to vegetation. It has been extensively used by the Peruvians since the 12th century, and the sterile soils of the South American coast are by its application made to yield luxuriant crops.

There can be no question as to the fertilizing qualities of the guano, and if it can be obtained in such quantities, and at such a price, as to make it available for the general purposes of agriculture in this country, it will become highly useful to the farmer. It has been used successfully with turnips at the rate of three cwt. per acre, harrowed in with the seed sown broadcast; and it seems, on the whole, to be better calculated for green, than for corn crops.

The quantity of this substance on the islands whence it is brought, is stated to be enormous. It is the accumulation of ages, and the sea-birds by whom it has been there deposited, are so numerous, that when they rise from their resting-places in the morning in flocks of miles in length, they are said to completely cloud the sun. Guano is the dung of these birds, and like pigeon's dung, it is a highly stimulating manure; but the circumstance of the sea-birds feeding on fish, may possibly impart to their dung a fertilizing quality beyond that of the dung obtained from the dovecot.

There are several *new manures* now artificially prepared, such as the sulphates and nitrates of soda and ammonia, and others having the names of their inventors given to them, and new ones are still occasionally added to the list; but it is unnecessary to notice any of these, until the test of experience has proved and established their efficacy.

Liquid Manure.—Urine has long been used as a manure by the farmers of Switzerland, Belgium, and Holland, who, with inferior means, are enabled, chiefly by the proper management of this article, to compete with the best of our farming establishments.

In the Flemish farm, all the cattle are kept and fed within doors, and the urine is collected into vaults of brickwork, which correspond in size with the extent of the farm and stock. Age and fermentation are found to add to the efficacy of this liquid as a manure, and the best constructed cisterns are divided by a partition, with a valve to admit the contents of the first space into the second, where it remains until ready for use. So sensible are the Flemings of the value of liquid manure, that after the farm-yard dung has ceased fermenting, they frequently throw water upon it, and the drainings and washings of the manure are alone carried to the field.

Cattle fed upon turnips, will each yield about two-thirds of the weight of the turnips in urine, or about a gallon for every twelve pounds; and it has been calculated, that the urine of three cows will enrich a quantity of earth sufficient to top-dress an acre of grass land. It has also been proved by experiment, that the urine of a moderate-sized person amounts on an average to about half a gallon per day, which, by a similar mode of application, would be sufficient to manure half an acre of ground every year.

Urine of every kind, when properly diluted with water, is highly nourishing for plants. Sir Humphry Davy considered that "it contains the essential elements of vegetables in a state of solution." Any method by which liquid manure can be saved deserves attention, and the careful landlord will urge and assist his tenantry in the construction of tanks and cisterns for the purpose.

The water in which flax is steeped becomes rich in fertilizing qualities, and should never be allowed to run to waste; but it ought to be carefully preserved, and applied to the land either in its liquid state, or else by mixing it with earth, peat, or other compost, which would perhaps be generally found the best mode of applying it. The fertilizing effects of flax-water are shown by the growth and colour of the grass where flax has been spread to dry. We have seen a most luxuriant crop of oats upon land manured with flax-water. If this valuable manure were always carefully preserved, and its application properly attended to, the complaint that a flax crop impoverishes the soil would not be made.

Liquid manure is no less valuable for the garden than the field. The Chinese apply liquid manure to their fruit-trees, as contributing much to their growth and vigour; and in that country it is sold in the streets, for the purposes of garden culture, in quantities so small as an English pint.

Liquid manure is highly beneficial to strawberries, and to gooseberry and currant trees, when applied immediately before the breaking of the bud in spring. It makes potatoes, whether early or late, large in size and very productive. The most efficacious time for applying it is in the drills, immediately before or after the brairding of the plants. The young shoots rapidly imbibe the nourishment, which makes the stems and tubers very luxuriant, and they require no other manure. To the cabbage and colewort tribe it is equally valuable. We wish earnestly to impress upon every cultivator of the soil, that it is very important for his own interest, to collect this valuable description of manure by every means in his power.

The night-soil of Paris is now formed into cakes, with a mixture of lime and ashes, and in this shape is exported to Flanders and the Low Countries; where, after being dissolved and converted into a liquid manure, it is extensively used, and is found to be particularly valuable as a top-dressing for grass lands. If the night-soil and urine now permitted to run to waste in London and our great towns, were collected and applied to the renovation of the soil, what an inexhaustible supply of fertilizing matter of the most valuable description would thereby become available for the purposes of agriculture! and there seems to be no good reason why this should not be done.

SPADE-DIGGING AND TRENCHING.

With certain kinds of soil, and in certain situations and circumstances, the spade may be profitably employed as an instrument of tillage: it may also be used with advantage for breaking in and reclaiming rough waste lands: but in all cases where the extent of cultivation is considerable, the plough must be resorted to.

In this variable climate, the process of tillage requires, in most cases, to be expeditious; and horse labour with the plough, by which a large amount of work may be done rapidly, is therefore indispensable, as well on this account, as with reference to its superior economy. To turn over an acre per day, is considered fair work for a pair of horses with the plough; but to dig the same quantity of land with the spade, would occupy a man from fifteen to twenty days. Twenty men might, it is true, do the same quantity of work in one day; but where are the requisite number of labourers to be found for doing this, when wanted?—and if they could be found at that particular time, how are they to be occupied in those periods of the year when such digging is not required?

The spade is therefore, as an instrument of tillage, chiefly available upon small farms, cottage farms as they are termed, and which are too small to afford labour for a pair of horses. It may also be used occasionally as an aid to ordinary tillage, where there is a redundancy of manual labour; in which case, if the land be a deep sandy loam, it will prove advantageous to trench it with the spade, to bury the exhausted top-soil, and bring the lower stratum of fresh soil to the surface. This practice prevails on the small farms and light soils of Flanders, where manual labour is cheap, and where green crops are raised to a great extent for the feeding of cattle. In wet seasons, moreover, you may often dig when you cannot plough; and in turning up stiff clay lands in autumn, and exposing the soil to the weather, the spade may sometimes be useful.

By double-digging or trenching the land, foul and exhausted soil is thrown to the bottom, and clean fresh soil brought to the surface. In garden-grounds this may be done with great advantage, the depth and quality of the active soil, being thereby greatly improved. In planting trees, deep trenching is the most certain mode of forwarding their growth. When planted on grass land, unless it be trenched, and the sward turned down, it often happens that the young tree will not strike root or flourish, and this applies to fruit as well as forest trees.

PLOUGHING.

The best ploughing is that which comes nearest to trenching, that is, which exposes the greatest quantity of fresh soil; and the best plough is that which most effectually accomplishes this object, and is most easily drawn. As to the depth, four inches may be considered light, six inches middling, and nine inches deep ploughing.

In very shallow ploughing, no fresh mould is brought to the surface, which is an important consideration; for the manure naturally filters downwards, and it is necessary to bring it again into action, by mixing the under with the upper soil. This can only be done by deep ploughing, by which the depth of active soil is increased, at the same time that fresh unexhausted soil is brought into operation.

The use of the subsoil-plough is highly valuable in this respect, for although it does not actually turn up the inferior stratum, it loosens and lightens it, and prepares it for being acted upon by the atmosphere and fitted for the sustentation of vegetable life. After subsoiling, therefore, there can be no doubt that deep-ploughing may be adopted with advantage; and it is believed that it will rarely, if ever, prove otherwise than advantageous, whether the subsoil-plough has been used or not.

Plough the land for green crops as deep as you can, that fresh soil may be exposed, and the surface deepened. Leave a head ridge all round the field, and plough it carefully, leaving no edges untouched, as a nursery for weeds. However winding the head ridge may be, if the others be straight, your field will have a neat and workmanlike appearance. If the plough cannot be worked into the corners, let them be dug with the spade, so that not a foot of land be left unturned.

The stubbles are often not ploughed until the spring, for the sake of allowing the cattle to pick up a few scanty morsels during winter. This is contrary to all sound principles of agriculture; for nothing fertilizes land more than exposure to sun and air, and the frosts of winter have also a very beneficial effect upon the soil. As soon as the crops are off, therefore, you ought to plough down the stubble, in preparation for the next crop.

It requires a farm of forty or fifty acres to give full employment to a pair of horses; and therefore a small farmer, having only twenty or thirty acres of land, should endeavour to plough in partnership with another, and thus obtain the benefit of a team. Those farmers are here spoken of, who have no other employment for their horses than what the cultivation of the farm affords: but there are cases where the distance of fuel and manure, and other circumstances, may make a horse necessary, when it would not be so otherwise.

There are various kinds of ploughs, some with and some without wheels, and new ones are still being invented. Each kind may be supposed to possess some advantages peculiar to itself, and one kind may be better adapted for certain situations than another; but as a general rule, it may be said, that the plough which most effectually opens the soil, with the least labour to the cattle, is unquestionably the best.

The operations of the plough, the harrow, and other instruments of the kind, are all for the purpose of loosening, pulverizing, and mixing the soil, and exposing it to the free action of the atmosphere; and the more effectually this is done, the better will be the produce. In a hard stiff soil, the plants find great difficulty in forcing their way through its unbroken texture in search of nourishment, and their growth is in consequence stunted and feeble; but if this soil be broken up by the plough, and reduced to powder by the use of the harrow and the roller, the plants will readily obtain the nourishment they require, and will flourish accordingly.

The farmer must bear in mind, that solid clods of earth afford no support to the plants; it is only when the clods are duly worked and broken down into minute particles, that the earth of which they consist becomes useful for the purposes of vegetation.

In ploughing, the breadth of the slice is generally about eight inches. The depth must depend on the nature of the soil, and the kind of crop intended to be raised; but it ought never to be less than four inches.

Six or seven inches will generally be sufficient, unless on soils of great depth, or for carrots and other taprooted plants, when the deeper the soil is loosened by the plough, the better will they flourish.

The breadth and elevation of the ridges vary according to the nature of the land. Sixteen or eighteen feet, and raised by two gatherings of the plough, is usually found to be the most convenient-sized ridge; but on dry grounds, it may be formed to any width. If the land is thorough-drained and subsoil-ploughed, it need not be ridged up at all, there being then sufficient means of escape for the water, without the aid of ridge-furrows.

Where the slope of the land will admit of it, the ridges should run as nearly north and south as possible, as they will then be more open to the action of the sun, than if running east and west.

A pair of good horses, working nine hours, ought to plough three-quarters of an acre on strong tenacious soils, and an acre or an acre and quarter on free and light soils. Much, however, will depend on the plough, which, if well made and of a good form, will be light and work easily.

The furrows in an acre will extend to 19,360 yards, supposing each furrow to be nine inches wide; and if we allow twelve yards additional to every 220 yards for the turning, the distance travelled in ploughing an acre may be taken at eleven miles and five furlongs. It has been calculated that when the ridges are no more than eighty yards long, half the working time of the team is lost in turning; but when the ridges are three hundred yards long, only an hour is lost in turning. It follows, therefore, that our fields ought to be of an oblong form, whenever circumstances will admit of its adoption.

When the soil is so stiff and adhesive, that the clods cannot be broken by the usual process of ploughing, cross-ploughing, harrowing, and rolling, recourse must be had to hand-labour with mallets; it being absolutely essential that the hard lumps should be broken down, and the whole of the surface-soil reduced to a pulverized state, without which a vigorous vegetation cannot be expected.

FALLOWING.

Generally speaking, if the land be well managed, and a due rotation of crops observed, an open or naked fallow will be unnecessary. But whenever the land gets foul from neglect or bad management, and the farmer is thereby compelled to resort to fallowing, it should be borne in mind, that the three great objects to be attained by a well-conducted fallow are, first, the destruction of seed and root weeds—secondly, a perfect pulverization of the soil—and thirdly, its exposure to the ameliorating influences of the sun and air: and in proportion as these important objects are secured, the productive powers of the land will be increased.

The regular cultivation of fallow crops, as drilled turnips, potatoes, mangel-wurzel, &c., is found to be generally sufficient for effecting these purposes, and to supersede the necessity for a naked summer fallow. On loose friable loams, and on lands denominated "turnip soils," the frequent disturbance of the surface during the summer months, in the operations of hoeing and moulding, opens it to the influence of the sun and air, and at the same time reduces it to the requisite degree of friability; but on soils of a tough adhesive kind, if allowed to get foul, it may sometimes perhaps be found necessary to give a naked fallow, in order to clean the land, and get it into a proper state.

Although a naked summer fallow will generally subject the cultivator to the loss of a crop, yet in some cases an effective fallow may be had on light soils, in time for the Norfolk or white stone turnip, which may be sown as late as the end of July, or even the beginning of August. In general, however, a fallow crop of mangel-wurzel or drilled turnips will be found sufficient to clean and ameliorate the land; and this crop, with barley the year following, will probably pay better than a crop of wheat.

Land may be fallowed under turnips in drill, or under potatoes, mangel-wurzel, or any other drilled crop that will admit of the intervals being horse-hoed; but the drills should be sufficiently wide apart to admit of this being done effectually, or it will be difficult to keep down the weeds. Beans are also considered a fallow-crop, but as they must be planted in March, if the land should require a good summer cleaning, the drills ought to be not less than two feet and a half asunder, in order that the intervals may be well worked with the horse-hoe, and for the weeds to be carried off without injuring the stalks.

The process of naked fallowing, when resorted to on strong land, should be as follows:—Winter-plough as deep as the roots of couch or rooted weeds have penetrated, and let the land lie in narrow ridges until February or March; then cross-cut the sods at the same depth, leaving them as open as possible on the surface. When the land becomes dry in spring, either scuffle it, or break it down with a heavy harrow, and leave it in a rough state for a fortnight, until the seed-weeds have vegetated. The land should then be rolled flat, and again well harrowed, observing not to roll more of it than what can be harrowed and well cleaned during the same day; for should showery weather succeed after the land is rolled, it will be more difficult to work it afterwards. After this operation, wait until more seed-weeds appear, when the land should receive the third ploughing, a little deeper than the first, and so remain until the same process is gone through again. The fourth ploughing is to be given at the period of putting in the crop; but should the season prove favourable for the destruction of weeds, and for the pulverization of the soil, no more than three ploughings may be necessary; although, as a general rule, it may be said, that the oftener the land is ploughed the better.

This is the only proper system of naked fallowing, and it is very different from the natural fallow, too commonly practised, where the land, become foul and exhausted by over-cropping, is left to lie waste for a season, throwing up weeds and rubbish.

SOWING.

The seed to be sown, must be suited to the soil and the climate. It should be sound, and have been thoroughly ripened; and it should not be the produce of successive crops on the same land, but be changed, or else be raised from seed which had been changed the preceding year. These points are each important, and will always be attended to by the intelligent farmer.

The effects of a change of seed are often extraordinary, sometimes nearly doubling the quantity of grain, whilst the straw is at the same time increased in proportion. The change may, however, be too extreme, and failure may ensue in consequence; and it seems therefore desirable to make the change, and to introduce the several varieties, gradually and successively, having regard in each case to climate, soil, and situation.

Sowing, though most commonly done broadcast, may yet be advantageously done by drilling, and on very small farms even dibbling may sometimes be resorted to with advantage, the saving of seed more than compensating for the additional labour. Instead of dibbling, the seed is sometimes dropped by hand into the furrow after the plough. By this mode much seed is saved, and the crop will rise as regular as if it had been drilled. It is somewhat less laborious than dibbling, but it takes more seed. In broadcast-sowing the chief object is to scatter the seed equally over the surface, leaving no part bare, and yet not too thickly sown. In drilling, the space between the drills admits of hoeing and hand weeding, and hence the land may be kept clean, while the crop will in general be more equal on every part of the field.

A prejudice sometimes exists against early sowing, because the straw is said not to be so bulky as when the seed is sown later; but if we observe the practice of those farmers who are most successful, it will be found that the man who is backward in his operations, who sows late, and consequently reaps late, is always poor;

whilst there is no surer sign of prosperity, than seeing farm-labour in advance of the ordinary practice. The first object with corn crops of every description is to produce the greatest weight of grain from the seed sown. The straw is a secondary object, and if fodder for the cattle be wanted, hay, clover, and turnips should be cultivated for that purpose. Every agricultural operation has its distinct object, to which other objects must be considered subservient; and it may be laid down as a general rule, that you cannot sow too early, if the weather be favourable.

CROPPING.

The particular kind of crops which it may be expedient for the farmer to raise, depends upon the nature of the soil, the climate, and other circumstances; but to vary the crops, and to have different crops in succession upon the same land, is absolutely essential in a right system of husbandry.

Every plant, in the progress of its growth and maturity, exhausts the soil; but all plants do not exhaust the soil equally nor in the same manner, neither do all plants restore to the soil the same quantity nor the same quality of nourishment; and hence it follows that, however well treated in other respects, no soil can long continue to nourish crops of the same kind without becoming exhausted, for every crop impoverishes the soil according as more or less of its own peculiar description of nourishment is abstracted from it.

Perpendicularly-rooting plants, which strike deep into the earth, ought to succeed such as spread their roots horizontally. Plants which greatly exhaust the soil, as all kinds of grain, should only be sown when the land is in good heart; and whenever a soil becomes exhausted by successive crops of the same kind, plants of a different kind, and such as are the least exhausting, should then be cultivated; and it may also be added, that this change of crops has a tendency to destroy noxious insects, those produced by one crop, being often not supported by another of a different kind.

Nature seems to require, and always provides for, a change in the crops of plants. When a forest is burnt down, trees of a different kind spring up spontaneously, in place of those which have been destroyed. When one kind of plant has exhausted the soil on which it grows, it pushes its roots to a distance in quest of its own peculiar food, and there sends up shoots, while a new race of plants grows up on the spot which it has vacated. The seeds of certain plants, such as the dandelion, thistle, &c., are so buoyant, that they are carried far away from the parent plant by the wind. The seed-vessels of other plants, such as the gorse, when ripe, burst suddenly, and scatter the seeds to a distance from the old plant. In these and in numerous other instances we find that Nature has provided for a perpetual change, an alteration from one condition to another, in endless succession. In the cropping of the ground, the judicious farmer will conform to this great law of nature, and study what species of plants he can most advantageously cultivate in succession.

It is well known that crops are not always abundant, in proportion to the quantity of manure employed, especially when cultivated on the same land for a succession of years. It is also known that land, which has thus become unsuited for one kind of crop, will successfully produce another; and upon these facts, confirmed by all experience, the system of *rotation* is founded.

The necessity for observing a certain rotation in cropping the land, is now universally recognised; and the questions which the farmer has to consider are,—first, what description of crop is any particular field capable of growing to the greatest advantage? and secondly, what is the best succession of crops to be cultivated, looking to the capabilities of the ground, and the means of improvement within reach?

Under the old system of farming, the land was generally cropped with grain until it became exhausted, and was then allowed to rest and recruit itself under natural pasture. Since the introduction of turnips and other green crops, the alternation of grain with these vegetables, has prevented much of the baneful consequences of the old system, and the produce of the soil has been greatly increased. Although this is the case however, yet, without the intervention of occasional pasturage, most soils will be apt in time to become languid, and get into a state from which the application of manure alone will not restore them.

Upon large farms under good management, in which cattle and sheep form objects of attention as well as corn, about half the arable land is usually kept under grass for pasture, hay, and soiling, and the other half is kept under tillage. These portions are constantly changing crop, slower or faster, according to circumstances; and this alternation may in fact be considered as the foundation of all good systems of farming.

There is one rule, however, to be invariably observed in all rotations, namely, that a fallow, or a fallow crop of turnips, mangel-wurzel, drilled potatoes, beans, or clover, should always intervene between two grain crops. If this rule is attended to, and a due rotation in other respects observed, the land will very rarely get into a foul or exhausted state, provided that proper care is taken to destroy weeds by horse and hand hoeing at suitable seasons.

Strong clay soils are especially adapted for the growth of wheat and beans, and may be continued under these crops alternately for several years. This is the most profitable course of cropping that can be followed on these soils, provided a sufficiency of manure be given, and the beans be thoroughly horse and hand hoed to keep down the weeds. Under favourable circumstances, this course may be continued for six or eight years, or even longer; but to ensure luxuriant crops, the soil must be manured every third year. A crop of clover, vetches, or rye-grass may however be advisable occasionally, to be succeeded by oats; and if the soil should get foul with root-weeds, which will rarely be the case under good management, a naked summer fallow may be resorted to for the purpose of destroying them, and this would begin a new rotation of alternate wheat and beans.

A favourite rotation on the strong lands of Essex is—1. A Fallow crop, manured; 2. Barley; 3. Clover; 4. Wheat; 5. Beans, manured; 6. Wheat; 7. Oats. It is a rule in Essex never to put in wheat after fallow. Although two successive crops of corn are justly objected to, yet upon land of this description, wheat and oats are sometimes taken after each other, without doing material injury.

In the north of England, and the colder parts of Scotland, beans will not ripen in some seasons, and the clay soils are often thin and sterile. In such districts the following rotation has been found to answer:—1. A Fallow crop, manured; 2. Barley or oats; 3. Clover, cut in the first year, and pastured for two years; 4. Oats; and then a new rotation begins. By this method the rotation is kept up for six years, a period long enough on those cold meagre soils.

On light lands, every rotation should be established on a well-wrought and well-manured fallow crop. The course of crops generally suited for light soils is—1. Turnips in drill; 2. Barley; 3. Clover and rye-grass; 4. Oats; and then a new rotation. This rotation may be repeated indefinitely, provided the turnip-crop be eaten on the ground, and that the manure derived from the clover and the hay is all returned to the land.

When manure is abundant, alternate white and green crops may be grown in the following rotation:—1. Potatoes or turnips, in drills; 2. Wheat; 3. Drilled beans or peas; 4. Wheat or barley; 5. Potatoes or turnips; 6. Wheat or barley; 7. Clover and rye-grass: 8, Oats. The advantage of this course is that it secures a good crop of clover, and it is practised near Edinburgh for this purpose. In the vicinity of London, Edinburgh, and Glasgow the rotations are frequently —1. Potatoes; 2. Wheat; 3. Clover and rye-grass. By some the clover is followed by oats, and the rotation again begins; others end the rotation with clover.

Sandy soils require liberal treatment to ensure their producing good crops, for in dry weather they are apt to become so parched as to be unfit for the growth of almost any species of plant. The application of clay and marl will improve the texture of such soils, and change their constitution to a sandy loam. When well manured, sandy soils produce good crops of potatoes or turnips. Wheat, beans, or peas do not succeed so well in them as barley, oats, and rye, which are the grain crops that yield the most profitable return; and occasional pasturage is necessary. The following six years' rotation has been recommended for very light sandy soils:—1. Turnips, with manure; 2. Barley or oats; 3, 4, 5. Grass, pastured by sheep; 6. Oats.

On land situated in cold exposed districts, the grains usually cultivated are the early varieties of oats and barley, with turnips and potatoes. The following course of crops may be followed in such situations:—1. Oats from old ley; 2. Turnips or potatoes; 3. Oats or barley, sown with perennial clover and grass-seeds; 4. Hay; and then pasture.

In mountainous districts, and in very elevated and exposed situations, tillage can in general only be advisable so far as it conduces to the production of turnips and hay for the stock, and as furnishing manure for the land. The corn crop is not to be looked to as a source of profit in itself, so much as affording straw and provender, for the cattle. The dairy and the rearing of live-stock, generally form the chief considerations in all hilly cold-lying districts.

The modes of cropping above given vary considerably, but all conform to one general principle, and embrace alternations of green and grain crops. It is necessary to mention, however, that the land in time is apt to become tired of one unvarying rotation, and seems to require changes in the crops, or a change of rotations. This is effected by either changing the green crops in the rotation, or alternating one rotation with another. The latter plan, which is called shifting the course, is adopted by many of the best agriculturists, and may be safely recommended for general observance.

ROTATION OF CROPS.

It may perhaps be thought, that what is stated under the preceding head, would be sufficient on this subject; but the due rotation of crops is a matter of such vast importance to the farmer, that it cannot be too often pressed upon his attention; and the constant change of crop is as applicable to a farm of five, as to one of fifty or five hundred acres, and is alike necessary in all.

The simplest rotation is that of wheat and beans alternately, without intermission; but this can only be adopted in the very richest soils, and is of rare occurrence. Another almost equally simple rotation is that of barley and turnips alternately, with an occasional crop of clover, the turnips being fed off by sheep. But perhaps the oldest rotation known, and which has been in use throughout Europe since the time of the Romans, is the triennial rotation of fallow, winter corn, and summer or Lent corn; that is, wheat or rye sown in autumn, and barley or oats sown in spring. This rotation had some advantages, or it probably would not have continued so long in use; but the loss of a third part of the land by fallow, which it caused, at length forced on the cultivation of other crops less calculated to exhaust the soil. One of the first of these was clover, and afterwards turnips; and by the introduction of these crops, a most important change has been effected in the whole system of European husbandry.

By substituting turnips for an entire naked fallow, and interposing clover between the summer and winter corn, the improved Norfolk rotation has been obtained, viz.—1. Turnips, manured; 2. Barley; 3. Clover; 4. Wheat. The inconvenience of this rotation is the frequent failure of the clover, if sown every fourth year; and this has compelled the farmer to resort to other crops instead, such as rye-grass, tares, &c., and to vary and extend the rotations according to the nature of the soil, and other circumstances.

With the small farmer, the rotation should generally be what is called a five-years' shift: that is, the first year, potatoes or turnips, manured; in the second, barley and grass-seeds; the third, hay; fourth, pasture; and fifth, oats. Barley may sometimes be sown after oats, if the land is clean and well pulverized, and if manure can be spared; but as a general rule, oats should follow grass; turnips, potatoes, or mangel-wurzel, should follow oats; and barley with clover, and grass-seeds, should follow green crops.

Wheat is not included in the above rotation; but where the soil is suitable, wheat may be cultivated with advantage, and should come in upon the clover-stubble, or else after turnips or potatoes, instead of barley.

Some persons may suppose that the land will not bear this constant turning and ploughing, but this is a great mistake. If repeated ploughing were injurious, how happens it that the land produces good crops after a naked summer fallow, when it has been ploughed perhaps four times, with little intermission? It is not the constant ploughing that does harm, but the constant grain crops, without regard to rotation. Ploughing is always beneficial, if a proper change of crop is observed.

As a general rule, it must be remembered, that two grain crops cannot be taken in succession without injuring the land, and in the end causing a loss to the farmer. By interposing an alternate *green* crop, full as many *grain* crops may be had off the same land, and with the same quantity of manure, within a given number of years, as could be obtained by taking them in succession; with this additional advantage, that you have the benefit of the green crops, and keep the land always in good heart.

Continued cropping with grain, will in the end leave the soil so exhausted, that it will not yield even grass: but if grass-seeds had been sown with the first crop of grain, there would have been a crop of hay and after-grass in the second year, and the next crop of grain would have been as good as the first. This is what ought to be done, where the land is not suited to clover; and the last exhausting grain crop should be put in upon land intended for potatoes, turnips, clover, or other green crop in the succeeding year, which will restore it to a state fit to produce grain again the year following.

There are particular juices in the soil suited to the nourishment of particular crops; and each crop exhausts its own particular juices, leaving the land unfit to bear another crop of the same kind. A bean-plant was taken up, and its root put into clear water; the plant continued healthy for some time, but the water became coloured by a discharge from the root of the bean-plant, which soon withered. The root of another healthy bean-plant was then put into it, but it withered immediately. The root of a wheat-plant was next put into the same water, and it not only lived and flourished, but it absorbed the colouring matter left by the bean-plant, and cleared the water completely.

By experiments of this kind, it has been ascertained, that one crop not only exhausts the soil of particular juices, but actually leaves matter in the soil injurious to another crop of the same kind; but which matter is absorbed by a crop of a different sort, whose growth it will not check, if it even does not promote it. Therefore corn, the roots of which spread near the surface, ought to be followed by a green crop—such as beans, potatoes, turnips, mangel-wurzel, carrots, or clover, &c., whose roots descend deeply, and extract nutriment of a different sort from that which supports corn. All drilled green crops likewise admit of horse or hand hoeing, and thus afford the benefit of a summer fallow, whilst their consumption by the cattle creates rich manure: so that by the intervention of drilled green crops, the land is in fact prepared for the most vigorous growth of corn crops.

If the soiling of cattle in summer, with green-crop feeding in winter, were to come into general use, there can be no doubt that the farmer's profits would be greatly increased, whatever the size of his farm. It is the sure characteristic of a good system, that it may be pursued with advantage even on the smallest scale; but if practised on a large scale, a proportionally greater profit will of course be derived from it.

On a small farm, one-fourth of the land might be under potatoes, mangel-wurzel, beans, or turnips; one-fourth in barley or oats; one-fourth clover, vetches, rape, or lucerne; and the remaining fourth in wheat, if the soil be suited for it. Let the small farmer once bring his land into this rotation, and it will afterwards be easily kept in order, and yield him a great increase of produce.

The following *four-years' rotation* has been recommended for a small farmer, holding about twenty acres of land, and having, by means of stall-feeding his cattle, secured a sufficiency of manure:—In the first year, five acres, properly manured, are to be planted with green crops, in which are included potatoes, turnips, cabbages, beans, and mangel-wurzel, according to the nature of the soil and other circumstances. The next year five acres more to be manured and similarly planted; and the same the third year; and in the fourth year, the whole farm will thus have been gone over. After each manuring, the land should be occupied with the following succession of crops:—First year, green crops as above; second year, wheat, oats, or barley, with clover; third year, the clover to be cut for the cattle, making into hay whatever there may be to spare; fourth year, oats, wheat, or barley. The fifth year the same rotation may commence again, five acres, well manured, being again placed under green crops, and the other crops in succession, as before. The farmer will thus get four productive crops from one manuring, and will always have one-half of the entire farm in grain, one-fourth in clover, and one-fourth in potatoes, turnips, &c.

To make the above rotation more simple, all the manured land is supposed to have clover sown with the first grain crop; but the farmer may sow only half in clover, and put the other half in vetches, Italian rye-grass, or cabbages, if he wishes to have variety of food for his cattle, which is generally desirable—the only point insisted upon being, that two crops of grain are not to be taken in succession off the same land. It may also be observed, that the dung obtained by house-feeding the cattle, will enable the farmer to manure the stubble of the last grain crop; and then to sow or transplant rape, which will yield a good return, and be off the ground in time for the potatoes and turnips which precede the second grain crop.

The above rotation is not recommended as being invariably the best, for the variety of soils and circumstances is so great, that no single plan of rotation can suit every case; but the principle on which it is founded is of universal application, and is as suitable to a farm of five acres, as to one of fifty or five hundred.

When wheat is cultivated, the usual mode is to put in the crop directly after turnips, clover, or other green crop, adding some lime harrowed in with the seed. The farmer who has not sown clover with his wheat, should on no account put in oats the following year, but take a crop of vetches or field-beans, which will leave the ground in a fit state for either oats or barley; and then it ought to return again to potatoes, turnips, mangel-wurzel, or other green crop, and go through the rotation anew. By this mode two manurings give, first, turnips, or potatoes, or mangel-wurzel; then wheat; then vetches or beans; and lastly oats or barley—that is, *four* crops from *two* manurings; but the rotation previously suggested gives *four* crops from *one* manuring, which is a better return, if the land be strong enough to bear it. It also keeps one-fourth of the land always in clover and vetches, by which provision is made for the cattle, and for the accumulation of stable-yard manure to be used instead of lime; for it must always be remembered that lime cannot be safely applied, year after year, to the same land.

The four-years' rotation is termed the Norfolk course, and it is in a great measure by its adoption, that the husbandry of that county has become so celebrated. Other rotations may be produced, simply by prolonging the period for which the land sown with grass-seeds, is allowed to remain under grass.

When *a five-years' course* is intended, the land will remain two years in grass, thus:—1st year, a fallow or green crop, manured; 2nd year, corn; 3rd year, sown grasses; 4th year, pasture; 5th year, corn crop, generally oats or barley. This rotation is less severe upon the land than the four-years' course, and, requiring less manure, is better adapted to soils of inferior quality: but it does not yield so great a produce as the four-years' course; and, therefore, where the soil, or the command of sand, sea-weed, lime, marl, chalk, or other manures admits of it, the latter may properly be preferred.

In other cases, the five-years' course will probably be found the best; and in this course, wherever the soil is suited to the production of green crops, the first crop of the rotation should be of that kind; but when the land is not suited to the production of green crops, or when, from previous mismanagement or other cause, a naked summer-fallow is necessary, then the fallow may supersede the green crop in the first year of the series.

The land being allowed to remain two years in grass, makes the five-years' course very suitable to soils of an inferior order; but it is nevertheless often found necessary, when the soil is very poor, or much exhausted by over-cropping, to allow it a longer rest; in which case the land, instead of two, remains three or even four or more years under grass.

Where the land will not bear a frequent return of the clover crop, the following rotation has been found to answer, on heavy clay lands:—1st year, winter or early tares, to be fed by sheep, and followed by turnips and rape, to be likewise sheep-fed; 2nd year, wheat; 3rd year, clover on one-half, with trefoil and rye-grass mixed on the other half, to be fed by sheep and followed by spring-tares; 4th year, wheat; 5th year, winter-beans. In the next course, clover takes place of trefoil and rye-grass, and *vice versâ*, so that the clover crop will return only once in ten years, which is sometimes an advantage. The change may still be extended by occasionally substituting mangel-wurzel, potatoes, carrots, or cabbages, for turnips; but attention must be paid to the condition of the land, and manure should be given to it when necessary. If chalk can be obtained, it may always be applied with advantage upon stiff clay soils to almost any extent.

The *four* and the *five years' courses*, above given, are suited to a great extent of land in Great Britain and Ireland; but the richer clays, and lighter loams of the better class, admit of a more extended and varied range of cultivation. The particular crop to be raised, often depends upon local circumstances, and it will be easy to extend the course so as to include any number or variety of additional crops.

Let it be supposed that the land is a strong clay, and not in so foul a state, as to require a naked summer-fallow. The course may then be—1st year, fallow crop, manured; 2nd year, wheat; 3rd year, sown grasses, generally for hay or green forage; 4th year, oats; 5th year, beans, manured; 6th year, barley or wheat. This is an excellent course where the soil is sufficiently strong, and does not require rest in pasture. Under this rotation it will be seen that two-thirds of the farm are under exhausting crops, and one-third in summer-fallow and restorative crop.

A slight variation may occasionally be made in this course, without departing from correct principle, namely —1st year, fallow crop, manured; 2nd year, wheat; 3rd year, beans; 4th year, barley or wheat; 5th year, sown grasses; 6th year, oats. But this rotation may be made less exhausting, by allowing the land to remain two years in grass, when the course becomes—1st year, fallow crop, manured; 2nd year, wheat; 3rd year, sown grasses; 4th year, grass; 5th year, oats; 6th year, beans; 7th year, barley or wheat. In which case we have three-sevenths in the restorative crops, and four-sevenths under exhausting crops.

When the soil is light and friable, and even with stiff clays, if they are not extremely foul, a naked fallow may always be dispensed with. Fallow crops rightly managed, with a due alternation of other crops, will keep down weeds, and prevent the necessity for a naked fallow.

The following rotation has been recommended for light loamy and sandy soils:—1st year, green crop drilled, (as turnips, potatoes, mangel-wurzel, or the like,) manured; 2nd year, wheat or barley; 3rd year, sown grasses; 4th year, oats; 5th year, peas or beans, manured; 6th year, barley or wheat.

Under this course two-thirds are exhausting crops, and one-third restorative crops; but this rotation requires a good soil. It may, however, be rendered less severe, by allowing the land to remain two years in grass, in which case the course becomes—1st year, green crop, manured; 2nd year, wheat or barley; 3rd year, sown grasses for green forage or hay; 4th year, grass for pasture; 5th year, oats; 6th year, beans or peas, manured; 7th year, barley or wheat.

We have in this case three-sevenths in restorative crops, and four-sevenths in exhausting crops, in which respect this rotation appears to be inferior to the four-years' course; but it is superior to it in this, that the crops are more varied; and if wheat be only taken once in the rotation, it will fulfil the rule, that two crops of the same kind should return at intervals as distant as possible from each other.

The following *six-course* rotation has been found to answer extremely well in Ireland:—1st year, potatoes, mangel-wurzel, or turnips, manured; 2nd year, wheat or oats; 3rd year, flax; 4th year, clover; 5th year, grass; 6th year, oats. This course gives six crops for one manuring; and clover always answers after flax, which is a great object to the agriculturist.

But if a crop of flax is not desired, a *five-course* rotation may be adopted, as follows:—1st year, turnips, mangel-wurzel, or potatoes, manured; 2nd year, beans; 3rd year, barley; 4th year, clover; 5th year, oats or wheat.

The several courses above given, will serve to show the system of rotations applicable to British husbandry. These rotations have all been proved, and they are all capable of being advantageously reduced to practice; and each may form the basis of other courses, where crops not here enumerated are desired to be introduced.

GRAIN CROPS.

The grain crops chiefly raised in this country are *wheat*, *barley*, *oats*, and *rye;* but before we proceed with particular directions as to the mode of management suitable for each, we will briefly notice a few of the depredations to which these crops, and more especially wheat, are exposed in different stages of their growth, first by insects, and then by birds.

The wheat-fly, and the Hessian or American fly, are both very destructive to wheat. These insects appear early in summer, and deposit their eggs on the young heads of corn. In the course of a week or ten days the eggs produce caterpillars, which feed upon the young grain, causing the head to shrink and shrivel. They then fall to the ground, and bury themselves beneath the surface.

The wire-worm commits great ravages on the wheat crops, and it has been calculated that as much as sixty thousand acres of wheat, are annually injured or destroyed by it in England.

The slug is very destructive to young wheat, eating through the stem, and destroying the plant. The slugs are most abundant in spring, and applications of salt, saltpetre, quick-lime, and lime-water, will generally be found efficacious in preventing their ravages. A single drop of lime-water will kill the slug.

It is supposed by many persons that crows, rooks, and other birds, consume and injure the corn crops; but this is in a great measure a mistake. The field-birds generally feed upon worms and insects, and the crows in particular are ever active in picking up slugs, and clearing the ground of caterpillars, and other enemies of the farmer.

The owl is a most indefatigable mouser, both in the field and homestead, and ought to be protected and cherished wherever he takes up his abode.

The rooks are eminently useful to the farmer, for they feed, during a great part of the year, on the grubs and slugs which bury themselves in the earth, and devour the roots of the plants. These the rooks, with their strong bills, dig up and devour; and thus confer a great benefit on the husbandman, whilst catering for their own support.

The crow feeds on grubs like the rook, and is similarly useful. He is a watchful sentinel, and keeps most other birds at bay; and if he occasionally digs holes in your turnips, it is done in search of the grubs, which would else do you greater mischief.

The magpie, the jackdaw, and the jay, likewise feed on insects, and are therefore not without their use to the farmers.

Among the small birds, the finches will certainly assert their claim to a share of the farmer's turnip-seed; but they will also consume the seeds of the charlock and the thistle, and will be often seen with a caterpillar in their bill. Indeed nearly all the birds which visit us in summer, come in search of the insect tribes, on which they feed; and which, but for these birds, would become so numerous as to be unbearable. This does not, however, apply to the sparrow, which is an impudent thief, and is constantly plundering the farmer, who should omit no opportunity of destroying him.

Polecats, stoats, and weazels, destroy mice, and are valuable guards to the stack-yard; although they are dangerous to the poultry, which should be kept out of their reach.

We will now describe the mode of cultivation applicable to each of the grain crops, premising only that the rule which has been before laid down, namely, that two grain crops are never to be taken in succession off the same land, applies alike to all. This is in fact the foundation of all good husbandry, and must be invariably adhered to by every farmer who wishes to make the most of his land.

WHEAT.

Wheat, is the most valuable of all the grains, and its varieties are very numerous. In general, the fine white wheats are preferred to the brown and red, and fetch a higher price in the market; but the latter are considered most suitable for wet adhesive soils and unfavourable climates, on account of their superior hardiness and early ripening. In fact the white wheat is now rarely cultivated, except on superior soils, and in favourable aspects.

The richer description of clays and strong loams, are the soils best adapted for the growth of wheat; and if properly cultivated and manured, any variety of these soils will produce good crops. Wheat land ought to consist of a large proportion of clay, and but little sand; for although light soils may be made to produce good crops of wheat, yet the strong clay lands in general yield the heaviest grain. Sandy soils are deficient in firmness, and do not generally afford sufficient support to the roots of wheat, which do not strike deep; yet there are, nevertheless, some light soils which produce excellent wheat.

The time for sowing wheat, must in some degree be regulated by the state of the land, and the character of the season. It may be sown from the end of August to the middle of November, but on stiff clays it is proper to sow as early as possible. In the opinion of many experienced farmers, the best season for sowing wheat, whether on fallow or ploughed clover stubble, is from the beginning of September, to the middle or end of October; but this, as before said, must depend much upon the state of the soil and the weather. On dry gravelly loams, in good condition and well prepared, wheat will succeed when sown in November; after which month the sowing of wheat ought not to be hazarded, until the spring comes round.

When the ground can be properly ploughed after turnips, spring-wheat may be sown any time between the 1st of February and the middle of March; and it is customary, in order to get the seed in as soon as possible, to plough and sow the land in successive portions, as fast as the turnips are consumed off it; but in general it is only on land of a good quality, and in good condition, that spring-sown wheat can be cultivated with success. Under favourable circumstances, however, such lands will produce nearly as many bushels of wheat as of barley; and as the wheat crop, on an average of seasons, will greatly exceed the value of the barley crop, the culture of spring-wheat is an object not to be altogether neglected by the farmer. The seed should always, however, be of the true spring sort, and taken from wheat known to have been sown in the spring of the preceding year.

On rich loamy soils, winter wheat may be sown after any green crop, whether fed off the land or not. If the land be foul and encumbered with weeds, it will be a good plan to sow winter vetches early and thick. If they come a good crop, they will smother and destroy the annual weeds and grass, and will leave the land light and mellow for the wheat crop. The vetches may be mowed, or else be eaten off with sheep. By the last method, manure and labour are saved, and in either case a naked fallow is avoided. Upon good light lands, wheat may be always grown on a clover-ley. It will also do well after turnips, vetches, or rape, if fed off or folded with sheep; and one ploughing after either of these crops will be sufficient.

Wheat is generally sown broadcast, but drilling is often practised on light soils, especially if the land be infested with weeds; as the drill allows of hand-hoeing and weeding, which is of great advantage to the crop. A third process is what is termed ribbing. The seed is scattered by hand, after the plough, and falling for the most part into the furrows between the ribs, it has the appearance of having been drilled, the ribs being then harrowed across. This process, and drilling, have the advantage of allowing the operation of weeding with greater ease than when the grain is sown broadcast. It also admits the free circulation of air between the plants, which is of great importance when the wheat is ripening.

The usual mode of broadcast-sowing, on stiff retentive soils, is upon 15-feet ridges, raised a little in the centre, and gently sloping towards the furrows. If on light or open-bottomed soils, 18-feet ridges are to be preferred. The seed is covered by a double stroke of the harrow, up and down the ridge, and another double stroke across, and then finished by giving lengthwise a double or single stroke, according to the nature of the soil. The rounded shape of the ridges enables the rain-water to run off freely into the furrows, which are merely cleared out with the plough. If water lodges in any part of the field, a few open drains must be cut with the spade, to allow it to run off into the ditches and open drains.

Drilling may be readily performed, if the land be well harrowed previously. The drills are usually from twelve to fifteen inches asunder, made with a seed-plough, one turn of the plough for each drill. If a seed-plough cannot be got, by taking the mould-board off a common plough, it will serve nearly as well. The seed may then be sown over the drills, as in ribbing; and by passing the harrow lightly up and down, the seed is conveyed to the bottom of the drills, and covered.

Another plan is to drop the seed by hand into the furrows, after the plough, by which half the seed is saved, and the crop appears as regular as if it had been drilled. This is somewhat less tedious than dibbling, but it takes more seed.

Dibbling in the seed may occasionally be resorted to with advantage, on small farms; but it requires too much labour to be practised on large farms, although it is still sometimes done in Suffolk. It is performed by one man with a dibbling-stick, making a hole about an inch deep, and three or more children dropping in the grains, and then drawing the earth into the hole with their fingers; after which, the land should be gone over with a bush-harrow, and then rolled. Dibbling saves seed, and the grain is more equally distributed than by the broadcast method, and it will answer in a small way, and where labour is abundant and cheap.

When broadcast-sowing is practised, harrowing and rolling will be the principal after-culture necessary. These operations are requisite to loosen and pulverize the ground, on strong clay soils. The operation of harrowing should be done in the spring, when the plants are four or five inches above ground; and attention is necessary to this point, for if the plants are too far advanced, their growth may be checked by the operation.

Rolling in spring ought never to be omitted. Light soils are frequently left in so loose a state by the winter frosts, that the roots quit the soil and perish. If the land be rough and cloddy, the roller has a more beneficial effect than the harrow in pulverizing the inert masses, and thus increasing the nourishment of the plants. Hand-hoeing and weeding are never neglected by careful farmers.

Feeding sheep on young wheat is sometimes practised, when the shoots are luxuriant, in the early part of spring; but the practice is open to great objection, as the sheep generally nip off the tender blade in the heart of the plant, which hurts its after-growth.

The quantity of seed per acre will depend much upon the nature of the soil, and the mode of culture. Poor land requires more seed than rich land. Drilling economizes the seed, and dibbling does this still more. The quantity accordingly varies from two bushels to three, a little less or a little more, according as the grain is drilled or sown broadcast. When sown in spring, there should be a liberal allowance of seed, as the plants have then less time to tiller and spread their roots.

Wheat is liable to several maladies, but smut, blight, and mildew are most to be dreaded by the farmer. Smut is a kind of fungus, which germinates on the plant; but as to its origin, and mode of cure, there are various opinions, totally dissimilar, and therefore of doubtful authority.

Among the remedies, or preventives for disease in wheat, the following have been recommended:—1. Sowing at a proper season, according to the nature of the soil. 2. Raising early varieties of seed. 3. Constant change of the seed. 4. Consolidating light soils with the roller after sowing. 5. Adopting a due rotation of crops. 6. Extirpating all weeds and plants that are receptacles of rust. These are doubtless all proper, and necessary to be attended to in the cultivation of wheat; and it is certain, moreover, that benefit has been derived from sowing four bushels of common salt per statute acre with the grain, and a like quantity in the spring, when the crop begins to tiller.

Wheat should be cut, when the straw has assumed a mixed colour of yellow and green, and before it is dead ripe; as then the grain is apt to drop from the ear, and the ear itself to break off, which causes a loss of grain. The best time for cutting all kinds of corn, is when no juice can be expressed from the straw immediately below the ear; the grain will then be comparatively clean-skinned and fine, and both grain and straw are more valuable than if allowed to be full or dead ripe. When over-ripe, the grain assumes a dusky colour, which is much against its appearance in the market.

Wheat is almost universally reaped with the sickle, and tied up in sheaves, which are set up in stooks, and left to dry. The smaller the sheaves the sooner will they dry, and the stooks should be so formed as to allow the wind to pass readily through them. When the knots or joints of the straw are perfectly dry, and free from juice, the crop may be safely carried to the stack-yard; and this need not be delayed by a slight shower of rain, for the straw being dry, and of a stiff open texture, a little rain will not cause it to heat, nor prove injurious to the grain.

BARLEY.

Barley, is hardier in its growth than wheat. There are six varieties of this grain, distinguished by the number of rows in the ear. The two-rowed is divided into two principal sorts, early and late. The early or quick-growing sort is the kind most extensively cultivated, and admits of great latitude in the season of sowing, having in some cases been put into the ground so late as the beginning of June: but when sown early, the straw is always much stronger, and the grain heavier.

Bear, bigg, or rough bear, is the hardiest variety of barley, and the earliest to ripen; and it is on these accounts much cultivated in the more exposed districts of the north, the chances of its coming to maturity being greater than with any other sort. It is generally sown in spring; and although mostly grown on poor land, is well adapted for cultivation on good soil. Its produce in the polders or carse lands of the Netherlands, sometimes amounts to ten quarters on an English acre.

Barley thrives best on a clean, rich, mellow loam, moderately retentive; and on clays tempered with sandy mould, or containing a certain portion of chalk and sand, it is found to succeed well. On wet soils it is rarely successful, and every kind of land on which it is cultivated, should be well worked, and thoroughly pulverized.

Barley usually follows turnips in the rotation, but it is found to thrive well after potatoes, or any green crop. If the turnips have been eaten on the ground, or if the preceding crop has been potatoes, the land should be well ridged up, in order to have it as dry as possible.

The application of a compost, consisting of lime, marl, or sand and earth, earth and stable-dung, or liquid manure, is of great advantage to the barley crop. If the harrow is not sufficient to pulverize the land thoroughly, the roller must be used to accomplish it. When turnips have been consumed on the ground, it is much trodden, and becomes hard, and will require two ploughings, after which it should be well harrowed and rolled. Indeed the soil for barley cannot be too finely worked.

.Barley should be sown as soon after ploughing as possible, when the land is fresh. This will ensure its speedy vegetation. The best season for sowing barley, is from the beginning of April to the middle of May; but it has, in some situations, been sown a month later with success. Drilling barley is practised in some places, the drills being nine inches apart: this mode requires much less seed, but the broadcast system is most generally adopted.

The quantity of seed depends in some measure upon the nature of the soil, but about four bushels to the acre may generally be considered as sufficient. Thin sowing is disadvantageous, if the season be dry, for the plants will then be stunted, and unable to throw out offsets to fill up vacancies. If, on the other hand, they be too much crowded, the plants are weak, and the grain inferior. In this, as in all other grain, care should be taken that the seed be full-bodied; and it should, if possible, be obtained off soil of a different quality from that in which it is intended to be sown, for a change of seed is always advantageous in every description of crop.

Clover and rye-grass are generally sown with barley, and the seeds are covered by the last harrowing, a light grass harrow being sometimes used for the purpose. Rolling is practised by some farmers immediately after the seed is sown, while others prefer allowing the plants to come above ground first; the small clods in this case acting as a shelter to the tender plants, which is found to be of service in frosty weather.

The following proportions of seeds may be sown with barley; viz.—For soiling the following spring, 2 bushels of Italian rye-grass and 12lbs. of mixed clover (red and white); or if for permanent pasture, 2 bushels of perennial rye-grass, ½ a bushel cock'sfoot, ½ a bushel foxtail, and 4lbs. of white clover,—a little trefoil and rib-grass might also be useful.

Barley is ripe, when the reddish colour on the ear is gone off, or when the ears droop and fall against the stem, and when the stalks have lost their verdure. In the harvesting of barley, more care is necessary than with any other grain, on account of the softness of its stem, and its tendency to vegetate. It is more liable to injury by wet than any other grain, and it is therefore safer, in a damp climate, to put it, when cut, immediately into sheaves and stooks, and not to allow it to lie loose upon the ground. It should remain in the field sufficiently long to harden the grain, and dry the straw; for if it is suffered at all to heat, it becomes discoloured, and is injured for the purposes of the malster, miller, and seedsman.

The produce of barley varies much, according to the soil and season, it being always the most productive in a warm season. On good soils, and in a favourable season, from thirty to forty bushels per statute acre is considered a fair average crop; but it sometimes is much less. Barley is principally used for malting; and it is also manufactured into pot or pearl barley, and barley-meal, in which latter states it is used for food in the north of England, and in Scotland. The straw is used as fodder, and as litter, for cattle and horses.

OATS.

The Oat, is a hardy grain, and is suited to climates which are too cold for wheat or barley. It generally thrives better in high regions, than in low-lying countries; and its cultivation has greatly contributed to the improvement of waste lands in Ireland, Scotland, and the northern parts of England. Taken in connexion with the artificial grasses, and the improvement of live stock, the benefits which the cultivation of oats has conferred upon the country, are very important.

There are numerous varieties of oats, which are difficult to discriminate, as they change very much in appearance when long cultivated on the same soil. They may, however, be classed into two general divisions,—early and late. The early kinds are useful for exposed cold soils, or late spring sowing. The later sorts require a longer time to come to maturity, and ought, therefore, to be grown on warmer soils, and to be sown earlier in the spring.

Of the early varieties, the Angus, the Black oat, the Dun, the Potato, and the Hopetown, are most generally cultivated. The early Angus sort produces good grain, but its straw is deficient, and the same may be said of the Potato kind. The Black oat is grown to advantage in cold and exposed districts, and is well adapted for newly reclaimed land. It is hardy and productive, and it is to be regretted that its culture is not more generally attended to. The Dun oat yields as abundantly as any other kind, and from the thinness of its husk, it is very productive of meal; the straw, however, is harsh and coarse. The Hopetown is a valuable description of oat, and well suited for high exposed districts, as well as for general cultivation. The Tartarian oat is excellent for coarse poor soils, and has been found superior for this purpose to the Potato oat. It is well calculated for exposed situations, having a less tendency to shed its seed than most other kinds.

When land is first brought into cultivation, or first broken up from pasture, oats generally form the first grain crop. Oats may also follow clover, and they are sometimes sown with clover and grass-seeds. They often follow potatoes and green crops, in which case the land should be ridged up in the winter, and when the seed is sown, the land should be well harrowed, and then rolled across the ridges.

The quantity of seed must depend on the nature of the soil, and the variety to be sown. On poor soils, from the plants not spreading, oats should be sown thick. The Hopetown, and some other varieties, do not tiller out, and therefore require more seed to be sown. The quantity of seed necessary, varies from four to five bushels per statute acre, and broadcast-sowing is generally adopted. A change of seed is always desirable with oats as with other grain.

The usual time of sowing oats, is from the middle of February to the middle of May. Early sowing is to be preferred, as the grain is then generally found of better quality; but late sowing often produces the greatest bulk of straw. Care must be taken to sow when the ground is dry; but the precise time between the two periods above specified must be governed by the weather, climate, and other circumstances, of which the farmer alone can judge.

Oats are more extensively grown in Ireland, Wales, and Scotland, than in England; and in the former countries greater attention is paid to the cultivation of this grain than in the latter, where the poorest soil is generally selected for it. The produce differs according to the soil and climate. The maximum quantity, soil and climate being favourable, may be estimated at fifty bushels, and the minimum twenty bushels, per statute acre; the average being about four quarters. Oat straw is preferred to any other as fodder for cattle, it being considered more nutritive.

The oat crop is seldom very seriously damaged, unless the season be extremely wet or windy; but the early varieties are liable to shed the grain when handled, and therefore require to be cut before they are quite ripe. This, however, should be done with caution, as cutting when too green is injurious. Oats form a considerable portion of the food of the people in Ireland, and also of the peasantry in Scotland, the northern counties of England, and the greater part of Wales; and the chaff, when mixed with turnips or potatoes in a steamer, is good for pigs and cattle. The straw is soft and elastic, and is used for a variety of purposes, as well as for the stable and farm-yard.

RYE.

Rye, is not much cultivated in the southern counties of England, although it produces good crops on indifferent soils. It does well on thin sandy soils, and on reclaimed bogs or moors; and its cultivation may therefore be often desirable. It is, however, necessary that the soil should be well worked, and kept in good tilth, and free from weeds.

In Germany, rye is universally used for feeding horses, the straw being sliced down and given to them as chaff; and in Holland the grain is much used in distillation. The produce of straw is very abundant, and it is highly prized for thatching.

There are two sorts of rye, the winter and the spring sorts. The latter succeeds well after potatoes, and is much grown on the Continent; but the former kind is chiefly grown in the British Islands.

Rye is useful for sowing with tares and winter vetches, the rye acting as a support to the vetch, and the mixture affords excellent spring feeding. A bushel to the acre is the usual quantity sown in this way. It is sometimes sown on stubble, after one ploughing and harrowing, for green feeding for lambs and ewes in February or March; and this practice, on light gravelly or sandy soils, is generally found advantageous.

Rye is much used for bread all over the continent of Europe, and also in Wales, and some parts of England and Scotland. It is often likewise mixed with wheat flour for that purpose, and is considered to be very wholesome. Rye is likewise much used by distillers, and is roasted and used as a substitute for coffee, by the poorer classes in the mining and manufacturing districts of England.

BEANS.

Beans. The bean, like all other plants cultivated for their seed, is an exhausting crop, although less so, it is believed, than any of the corn crops. From the nature of its growth, and its being always cultivated in drills, which admit of horse and hand hoeing, it must be regarded as a cleansing crop; and it is therefore well suited to prepare the land for wheat or barley. Beans thrive best on strong clay lands, heavy marls, or deep loams: but sandy soils are generally not well suited to their cultivation. In cold wet climates, and bleak, exposed situations, beans will rarely ripen.

In Scotland, beans are managed with the greatest care, and are proportionally productive. It is there not uncommon to see twenty acres of beans in one field, without a single weed being allowed to appear among them; the drills being so distant as to admit of a horse-hoe, or light one-horse plough, to work between them. Weeds are thus effectually kept down, and the ground is left nearly as clean and as fine after a crop of beans, as it would be after a naked summer fallow. In this way, beans form an excellent auxiliary to summer fallowing, and as a preparation for wheat.

Although most frequently drill-sown, beans may be dibbled with advantage, especially on small farms; but in all cases the ground ought to be ploughed with a deep furrow in the autumn, or early in the winter. Two ploughings in spring are always advantageous, and the winter furrow may be given in the direction of the former ridges, by which mode the land will be sooner dry in spring, than if it had been ploughed across. After the autumn ploughing, the land will be mellowed by the winter frosts; and early in February, if it be sufficiently dry, it should be cross-ploughed, and broken as fine as possible by heavy harrowing.

Do not, if you can avoid it, cart out the manure for the bean crop until it is wanted, and then spread it and plough it in at once. Take the furrow slices at about six inches; and in every third furrow, close to the edge of the cut, let women or children plant the beans, four to six inches apart; then cover the seed with the next furrow slice, and so proceed throughout the field, taking care to regulate the size of the furrow to the width of the drill. After this apply the harrow.

The root of the bean penetrates deep into the soil, and deep ploughing is therefore necessary to its perfect growth. With proper management, and on strong soils, the bean may be cultivated alternately with wheat, on the same land, for several years. In the Isle of Thanet, barley, beans, and wheat is the usual rotation.

Beans ripen slowly, and should therefore be put into the ground as early as the weather will permit: if later than the end of March, the ripening of the crop will be precarious. Indeed, beans must generally be considered an uncertain crop, in consequence of their backwardness in ripening, except under favourable circumstances of soil and climate.

The distance between the drills should be regulated by the nature of the soil. On strong clay land twenty-four to thirty inches is recommended, to admit the horse-hoe or plough to be freely used between the drills, for on such soils the hand-hoe in dry weather will have little effect. On looser and thinner soils, the intervals may be something less; and eighteen or twenty inches between the rows, will be found to afford room enough for hand-hoeing.

When the beans have made some progress, set the horse-hoe to work between the rows, and let this be followed by the hand-hoe, to cut up any weeds the horse-hoe may have left; and any weeds growing in the rows among the beans must be removed by hand. These operations must be repeated as often as necessary, and not a weed must be allowed to remain in any part of the field.

PEAS.

There are two varieties of the field pea, the early and the late. The early kind may be sown at any time till the end of May, but the late kind must be sown in February or March, to give it a better chance of ripening. The early pea seldom exceeds three or four feet in the length of its straw, and in a favourable season and good soil produces a good crop of grain. The late pea is larger in the grain, and its straw is five or six feet in length. It is more valuable for fodder, but is less certain in its produce, than the early sort.

Peas are nearly of the same nature as beans, in regard to nutrition; but they will grow on soils of a lighter and poorer quality: the preparation of the land is the same for both.

Broadcast-sowing of peas should never be practised. Drilling ought always to be adopted, as it is better for the crop, and admits of horse and hand hoeing, to keep the soil free from weeds; and it is only when this is done, that the cultivation of peas can be usefully adopted. When sown in drills, four bushels of seed to the acre will be generally sufficient.

The soil in which peas grow best, is a sandy loam, neither too moist nor too dry. A mixture of calcareous earth is highly favourable to the growth of peas; and chalk, marl, sea-sand, or lime, is found to forward their growth more than any other kind of manure. The grey or field pea is found to succeed best on strong soils, and the white or garden kind on light dry lands.

The straw, or haulm of the pea, cut into chaff, is used as fodder for horses. It makes excellent provender, and sheep are very fond of it. When the peas are ground into meal, and mixed with skimmed milk, they form very good food for calves; and they are also much used for feeding pigs.

The cultivation of the field pea is understood to be diminishing, since the introduction of the turnip and other green crops; and except near large towns, it has in a great measure given way to the bean.

HARVESTING.

To avoid loss of grain by shaking, you must cut the corn before it is dead ripe; and moreover, if allowed to stand until dead ripe, it assumes a dull dusky hue in sample, whilst on the other hand, grain not sufficiently ripened, shrivels in drying. In both states, it wants that brightness of colour, which is important in all grain; and it does not yield the quantity of farina which it would do, if reaped at the proper period, when it is neither too green nor over-ripe.

When the grain is ripe, the straw assumes a golden colour, from the bottom of the stem nearly to the ear, and the ear begins to droop gently—the corn may then be cut. If the straw be a little green below the ear, it is of no consequence, provided the stem be yellow at the neck, and also at bottom, which shows that no more nourishment is needed from the earth.

All kinds of grain do not shrivel alike, when cut too early. Wheat shrivels the most. Barley suffers next to wheat; and oats least of all, being covered with a strong husk or shell, and possessing the quality of filling and hardening in the stook. Barley requires to be thoroughly ripe. Where it is reaped with any green on the grains, it assumes a bleached dull whitish colour, instead of the rich golden yellow colour which it ought to exhibit.

Much loss of grain is incurred every year, by permitting the crops to stand until they are over-ripe. The loss which then takes place in the reaping, binding, and stooking; in the leading from the field to the stack-yard, and again in removing the sheaves to the barn for thrashing, is altogether very serious in amount. This loss may in a great measure be avoided; and we recommend the following practice, which has stood the test of experience, and been found generally to answer.

Reap before the corn is over or dead ripe—ledge for two, three, or four days, according to the weather—clear the corn and straw of weeds, clover, grass, &c., before binding—in binding, make the sheaves small—stook and hood them, when bound—let them rest in the stooks eight, or ten, or twelve days, having regard to the state of the weather; and then cart them to the stack-yard. In making the ricks in the stack-yard, if the weather be rainy, or the corn at all damp, construct chimneys or openings for ventilation, to guard against injury by heating; and thatch the tops as soon as practicable.

Barley and oats require to remain some time in the field after they are cut, before they are ready for stacking, as they are generally more or less mixed with grass and clover; and unless these are thoroughly dry, there is danger of their heating in the stack, and injuring the grain. The clover must be completely withered before the corn is stacked, and especial attention should be paid to this by the farmer. Care should also be taken that the stacks are built in a proper manner, the sheaves sloping regularly downwards and outwards throughout. When a stack is thus well built, and carefully thatched, it will be impervious to the rain, and secure from high winds.

Oats and barley are very generally cut with the scythe, but wheat is for the most part reaped with the sickle. The corn is cut closer to the ground with the scythe than by the sickle, and it is less liable to be shed, if over-ripe; but the scythe cannot be used if the crop is laid or much tangled. A good mower, with an attendant, will cut, bind, and stook an acre and a half in a working day of ten hours, which is about twice as much as can be done with the sickle. The corn should be cut as close to the ground as possible, by which a larger quantity of straw, and consequently of manure, will be obtained.

Various implements have been recommended for expediting the work of reaping, but the Cradle and the Hainault scythes are unquestionably the best. These may always be used for barley and oats, on level and cleanly cultivated ground, where the corn stands upright; otherwise the sickle and common reaping-hook will be found most advantageous.

THRASHING AND WINNOWING.

Oats and barley are for the most part thrashed with the flail, the straw being required for the cattle, which are supplied with it from time to time by the thrasher as he proceeds with his work: but for wheat, the thrashing-mill should always be used, it being cheaper, and, in all respects, better than the flail.

The thrashing-mill may be worked by horses, or by steam or water power. When driven by steam or water, one or two winnowing machines, according to the power employed, are usually attached to the mill, which effects a great saving of time and cost in preparing the grain. A powerful machine will thrash and winnow from two to three hundred bushels a day; and reckoning every expense, the cost of preparing the grain for market by this means will be found not to exceed a penny per bushel: whereas by thrashing with the flail, it would be double that amount, besides the waste of grain, which would add considerably to the cost.

The thing to be attended to in using the thrashing machine, is to give it a regular motion, and to have it equally fed with the corn. One man is employed to feed the mill with corn; a man or two boys to carry the sheaves, and a boy or a woman to untie and hand them to the feeder. One or more persons must likewise be employed to rake up the thrashed straw, and carry it to the straw-yard.

Portable thrashing machines are frequently let out to hire, and sometimes two or more neighbouring farmers join in keeping a machine for their common use, a practice well worthy of being adopted, wherever the farms are so small as not to make a separate machine for each necessary.

Winnowing-machines, or fanners, are required upon every farm, whether large or small, and they may either be used separately, or in conjunction with the thrashing-mill, according to circumstances. Some persons prefer the hand fanners, which are thought to work steadier than when driven by machinery, and to clean the grain more thoroughly; but either will do.

By the process of winnowing, chaff, bits of straw, seeds of weeds, and other refuse, are separated from the grain, which is then tailed, and finally dressed with riddles and sieves in the clean corn-room, the tailed corn being separated and kept for common use, and for the cattle and poultry. It is of great importance to the farmer that his corn should be thoroughly cleaned and dressed, its value in the market depending in no slight degree upon the manner in which this is done; and the grain ought not to be thrashed until it is required for market, for it will shrivel and lose in weight by keeping.

HAY-MAKING.

The following rules for conducting this very important operation, have been practised for a considerable period, and generally found successful; on which account they are here recommended for adoption.

Cut the grass when it has come to its full growth, and before it has ripened its seed. If cut when in a growing state, the unripe juices of the plant are apt to bring on violent heat and fermentation, and thus deprive the crop of much of its substance and nourishment.

Never shake the hay out of the swathe on the day it is cut, but on the second day shake all that was cut on the previous day, giving it two turnings. By shaking it out the day on which it is cut, the hay is reduced much by the heat of the sun; but by leaving it in the swathe, it '*soaks its own sap,*' and will be reduced very little afterwards.

Never leave the hay on the ground the night it is shaken out, but gather it up into small grass cocks that evening. By so doing, the dew goes off the ground much earlier the next morning, and one shaking out of the grass cocks on comparatively dry ground, will be of more service than three turnings, if it is left spread the night before.

After shaking out the grass cocks, turn the hay twice that day, and gather it into windrows in the evening, and then make it into cocks containing about a cwt. each. Let the hay remain in cock the next day, in order to '*soak the sap*,' as above-noticed; for by exposing the grass too often to the sun, it becomes much reduced in bulk and nourishment.

The next step is to gather these cocks into plats, about eight cocks in each, and if the day is likely to be fine, shake them all out, taking care not to spread them too wide; as by this means the hay would be too much exposed to the sun, and be injured in colour. Carefully turn the hay thus spread out, at least twice that day; and in the evening put each plat into one cock, so that they may be safe from rain, should there be any, but do not allow them to be tramped.

In this state let the cocks remain, without further disturbance; and on the day after pull them all round, observing to leave them as small in the bottoms as possible, in order to admit a free circulation of air under and about them—then rake them carefully, to secure them against storms; and continue this system until the whole of your hay is made up.

The above operations are supposed to be carried on under favourable weather; but when the weather is bad or broken, turn all the small cocks often, and double them continually, without shaking any out, until you have them fit to go into the large cocks; and then, if the day is likely to hold fine, shake them out thoroughly, and make them up the same evening.

When the hay is thus all made up, give it no time in the cock, but draw it in immediately, beginning with that first made; and if there be any newly-laid meadow, mix this hay carefully with that of the old meadow, and shake a small portion of salt on each course.

By the above process, if the weather proves favourable, there are only three days occupied in making the hay, until it is put into finished cocks. The hay thus made up may heat moderately, when stacked, but this will rather be advantageous than otherwise.

Tarpaulins for securing the rick, when drawing in the hay, will be found of the greatest advantage; and no farmer should be without these safeguards. They may be expensive in the first instance, but the loss which one rainy day might occasion in the quality of the hay, would in all probability be greater than the cost of the tarpaulins, the use of which will enable the farmer to keep the rick open until the whole crop is brought in, without risk or inconvenience.

GREEN CROPS.

Green crops may be said to comprise all the cultivated vegetables which are not included under the designations of corn and pulse; and it is on the judicious management of this description of crop, that the improvements which have taken place in modern husbandry are mainly founded.

Without the cultivation of green crops, there can be no adequate rotation of crops established, and the land would of necessity become exhausted of the particular kinds of nourishment required for the production of the different species of grain; and must then, as was of old the practice, be thrown out of cultivation, and left to rest for a longer or shorter period, to recruit its powers. The intervention of a green crop alternately with grain, prevents the necessity for this rest or fallow, and consequently prevents the waste and loss which would thereby be occasioned to the farmer.

Without green crops, it will moreover be impossible to provide support the year round for the number of cattle necessary to furnish the farmer with manure for keeping his land in heart, and in a state of fertility capable of yielding a remunerating return for the labour expended upon it. Unless there is a due supply of manure, there will be deficient crops—without a sufficient number of cattle, there will not be the proper supply of manure—and without green crops, the farmer cannot keep the requisite number of cattle ; so that, in reality, the whole of our present system of agriculture may be said essentially to rest upon the due cultivation and management of green crops.

It is the same with husbandry on the Continent, more especially in Flanders, where the utmost attention is paid to the cultivation of green crops, in the skilful management and judicious use of which, in stall-feeding their cattle, the Flemish farmers have attained to great excellence; and they are thereby enabled, with very inferior means in other respects, to compete with our best agriculturists in the amount of produce obtained from the land, and in keeping up its condition for a long series of years.

The green crops usually cultivated, consist of turnips, mangel-wurzel, cabbages, carrots, parsnips, potatoes, red clover, American cow-grass, Italian rye-grass, tares, rape, and lucerne; and of each of these we will now proceed to give some account, with brief directions for their cultivation.

TURNIPS.

The turnip was originally introduced from Germany about the year 1730 by Lord Townsend, who thereby conferred a most important benefit on British agriculture. It was first cultivated as a field crop in this country, in the county of Norfolk, where it still continues to be more extensively used than in any other part of England.

Before the introduction of turnips as a field crop, it was difficult to manage light soils to advantage, the land becoming soon exhausted by the repeated growth of corn; and as no regular rotation of green crops was then known, the land, when thus exhausted, was necessarily left fallow, or thrown into pasture to recruit. The soil of Norfolk is naturally very light, and yielded but little under this process; but turnip-husbandry, in regular rotation, has now rendered it highly fertile.

Turnips delight in a loose soil, in which they are raised to the greatest perfection, and with the least hazard. There is however no soil that will not bear them, when well prepared; and reclaimed moorlands, manured with sand, lime, marl, or the ashes of the burnt surface, will yield good crops. No plant prospers better in cold and wet districts, and no plant contributes more to fertility. By the application of bone manure, good crops of turnips are obtained at an altitude of 700 or 800 feet above the sea, in some of the mountainous districts of Scotland.

There are several kinds of this valuable root, all of which may be classed under the heads of *the White*, *the Yellow*, and *the Swedish*.

The white globe, or Norfolk turnip, is the most commonly cultivated, being suited to the light soils which are generally devoted to the feeding of sheep, and producing the heaviest crops, and coming the most early into use. It grows to a large size, and is very sweet; but it is tender, and should be consumed before Christmas, while its leaves are green, and its bulb large and succulent, as it rarely survives the frost. The Stone turnip is also white, and stands the weather better than the globe; and being equally sweet, and of a finer grain and greater specific gravity, it is very generally grown, in order to secure a succession of feed; but it does not swell to so large a size as the Norfolk globe.

The Aberdeen yellow is an intermediate species between the globe and the Swede, of a hardier nature than the former, and of slower growth; it is therefore sown earlier, and remains longer in the ground, which brings it into use after the earlier sorts have been consumed. It bears large crops, and is fully as nutritious as any of the white kind.

The Swedish turnip is by much the hardiest species known; the weather, however severe, being found to have very little effect upon it. It retains its nutritive properties until late in the spring, and is highly valued as affording support to cattle at that pinching season, between the failure of the common turnip, and the coming in of the young grass. The crops which the Swede yields, are not so large as those produced by the white and the yellow species; but the nourishment obtained from it is so much greater, that a smaller quantity suffices. Cattle fed upon Swedes will improve in condition, whilst if supported solely upon white turnips, they will only hold their own.

There are other varieties branching from these three leading kinds, and possessing qualities intermediate between them; but it is not necessary to describe these in detail. Their fitness for particular localities will be best shown by experience.

Turnips are always regarded as a fallow crop, and are introduced into that part of the rotation which closes one course, and commences another. The land intended for turnips must be ploughed with a deep furrow early in the autumn, after the grain crop is removed. Some farmers give three ploughings, one in the direction of the former furrows, the next across, and the third as the furrows are wished to lie. This must depend upon the nature of the soil, heavy clay lands requiring to be worked more than those of a lighter description. The harrow and the roller are also to be used to pulverize the ground, and the latter especially, care being taken that it is of sufficient weight to break the lumps; and all perennial roots should be carefully picked off.

No crop which is raised, is so well adapted as turnips, for the application of every kind of manure. Ashes, marl, chalk, sand, lime, rape-dust, broken bones, and bone-dust, oil-cake, sea-weed, and indeed every other kind of manure, are all alike calculated to produce good crops of this vegetable: but nothing hastens its growth so much as liquid manure, applied between the rows in an evening, care being taken that it is properly diluted. The Scotch farmers have a maxim, that "the turnip is the mother of the dung-heap, and the dung-heap is the mother of everything else." This is literally true; for if the cultivation of green crops be the foundation of good husbandry, as is undoubtedly the case, the cultivation of turnips must be placed at the head of the system.

The time for sowing the several varieties, is somewhat different: the Swedish should be put in the earliest, and then the yellow, both of them in the month of May; but the globe kinds need not be sown until June. After the middle of July, a full crop can hardly be expected, although crops have been obtained from a sowing in August, but this is not to be relied upon. A liberal allowance of seed is recommended, so much as three pounds for drill, and six pounds for broadcast, to the statute acre. The quality of the seed is of much importance, and should be carefully attended to, as degenerated or wrong sorts are often sold to the farmer, who ought therefore to deal with a respectable seedsman; or else he should save his own seed, taking care to select the best roots for the purpose.

For drill-sowing in ridgelets with farm-yard manure, proceed as follows:—When the ground is ready, commence opening the drills with the plough for receiving the manure, making the drills from 20 to 24 inches apart from centre to centre, according to the strength of the land. Then spread the manure equally in the drills, and cover it in with the plough, by going up the middle, and turning one-half of the earth to each side, so that the manure may lie in the centre of the drill when closed in. The earth, when the drill is closed, should cover the manure to the depth of about three inches.

When the drills are thus completed, sow the seed with a turnip-machine; or if this cannot be procured, and if the quantity of land to be sown is small, a furrow may be made with a hoe or pointed stick along the top of the drill, about an inch or an inch and a half deep; and the sowing may be effected by means of a bottle, having a quill inserted in the cork, with which the seed may be deposited pretty evenly, and with considerable rapidity. The seed is best covered by running a light roller over the top of the drills; or, in a small way, it may be done by drawing the back of a shovel, with a weight upon it, along the top of the drill.

The plants will in general make their appearance in about a week or ten days, according to the quality of the soil, and the state of the weather. When the second or rough leaves are about two inches high, a horse or hand hoeing is to be given between the ridgelets, to cut up the weeds close to the turnip-plants. The hand-hoe may shortly afterwards be introduced to thin the plants, leaving them at intervals of from eight to ten inches apart in the row.

Within a fortnight or three weeks after this has been done, the hoer must again go through the plants, removing the weeds which have sprung up in the interval, and trimming the earth round each plant, and at the same time cutting out any unnecessary plant which had escaped his previous notice; for if left too thick, or if there are two or more together, they will grow up long and weak, and not swell at the roots. After this they may be scuffled, or drill-harrowed, to loosen the earth and kill the weeds. When the plants have made tolerably large bulbs, a double mould-board plough is sometimes passed between the rows, for the purpose of ridging them, and earthing up the plants. This will serve to keep the ground dry, and assist their growth; and their rapid progress afterwards soon covers the intervals, and prevents the further growth of weeds.

On dry shallow soils in the south of England, raised drills have not always been found to answer for turnips, especially in dry seasons, the earth in the raised drill not retaining sufficient moisture to nourish the plant. In such cases, flat or level drilling, and broadcast sowing, are resorted to with advantage. When drilled flat, 20 inches apart, the crop may be cleaned with the horse-hoe, and thus all the advantages of the raised drill are secured. If sown broadcast, the hoeing must be effected by hand, which is expensive, and will require to be repeated four or five times to keep down the weeds, and regulate the growth of the plants.

Bones constitute a most valuable manure, especially for turnips. Bone-dust drilled in with the seed, ensures its early vegetation, which is essential to the production of a good crop; and in whatever shape applied to land, bones are highly beneficial. The farmer must however depend mainly upon the produce of his farm to supply the manure required for his crops, resorting to bones only as an auxiliary; and farm-yard and bone-manure may be used together in the cultivation of turnips with great advantage in the following manner:—

Commence preparing the land intended for a turnip crop immediately after harvest, and give it as complete a cultivation as possible before winter. A good coating of farm-yard dung should be ploughed in, and it is not necessary that it should be rotten, as it will be thoroughly decomposed and incorporated with the soil before the land is again ploughed in the spring. In the beginning of summer, another ploughing must be given, with repeated harrowings to destroy the weeds, and the soil will then be in the best state for nourishing the young plants. The seed may be sown in rows, about 2 feet apart, by means of a turnip machine that drills the seed and bone-dust together, the latter being applied at the rate of 15 bushels per acre. The plants must be thinned, and the ground hoed, and all weeds carefully eradicated, as is directed in Drill-sowing.

This mode of proceeding has secured good crops, especially of Swedes, in situations where the practice of ridging has been found to fail; for when deposited under the ridgelets in the usual manner, the manure sometimes becomes parched and inert in dry weather, and the seed sown on the top of the ridgelets, vegetates feebly through want of moisture: but neither of these objections apply to the mode of cultivation above described, which may be safely practised wherever circumstances are favourable for its adoption.'

In the cultivation of turnips, there are four things which ought to be carefully attended to: *First*, to have the ground in a finely pulverized state. This is accomplished by ploughing the land deep and roughly, before the frost sets in. *Secondly*, to force forward the young plants into rough leaf, in order to secure them against the attack of the fly. This is best effected by drilling the seed with bone-dust, rape-dust, prepared compost, or other stimulating and nourishing manure. *Thirdly*, to have the ground clean and clear of weeds before the turnips are sown, and watching the growth of weeds afterwards, and cutting them off before they choke the crop. *Fourthly*, to keep the ground constantly loose and open about the plants, by stirring it between the drills in dry weather. The oftener the ground is stirred the better; and you may rest assured that every drill crop is improved by having the soil turned up frequently, provided you do not disturb the roots of the plants.

The average produce of a corp of turnips has been taken as high as 25 to 30 tons per statute acre (including the tops), and at 20 to 25 tons after the tops are removed. It may, however, be questioned whether this quantity can be generally realized, although there is no doubt that products exceeding this amount have been obtained, where the cultivation has been well conducted; but it will perhaps be safer to reckon the produce, on an average, at from 15 to 20 tons per statute acre, of the larger and white kinds, and 10 to 15 tons of the Swede.

The turnip is liable to several diseases, amongst which the fly is the most formidable. Various expedients have been adopted to check this evil, although no specific remedy has yet been discovered; but a mixture of soot and quick-lime, strewed along the drills, and dusted over the plants when the fly appears, is considered to be of great use in checking the disease, while it certainly promotes the growth of the plants. The mixture may be applied at the rate of six or eight bushels per acre.

Turnips are generally allowed to remain in the field, and are taken up only as they are wanted. It may, however, be proper to take up a part of the crop towards the latter end of November, and store them for use in time of frost and snow; for which purpose the top leaves and tap-root should be cut off about an inch from the bulb, care being taken not to injure the bulb itself. The top leaves may then be given to cows or young cattle, and the turnips stored up against a wall, and covered with straw.

The farmer may easily save his own seed, by transplanting in November the turnips of the best form, and cutting off the tops. They will ripen their seed in the following July; but they must be planted at a distance from other turnips, and from plants of the cabbage and colewort species, or the seed will be likely to be mixed and spoiled.

MANGEL-WURZEL.

Mangel-Wurzel, is a large kind of beet, not liable to be injured by disease or insects; and it stands the climate well, and may be cultivated with advantage. It thrives best in a deep loose loamy soil, and requires a good supply of manure. It gives no unpleasant taste to milk or butter, and pigs as well as milch-cows are fond both of its leaves and roots.

From the 20th to the end of April is the best time for sowing the seed, and the process is as follows:—Prepare your land as if for drilling turnips, forming the drills two feet or thirty inches apart, according to the strength of the soil, and the deeper the better; fill them with short manure; cover them with four or five inches of earth; roll them lengthwise; and then, on the smooth and level top, make holes with a dibbling-stick, about an inch or an inch and a half in depth, and twelve inches apart; and into every hole drop two seeds, covering them by hand as you proceed.

When the plants are about two inches high, draw out from each hole the extra plant or plants, leaving of course the strongest and healthiest plant behind. Keep them clear from weeds by hand-hoeing, but do not earth them up. If any of the plants appear to be running to seed, pull them out, and transplant others in their room (after stirring up the earth), from a small seed-bed, which should be prepared at the time you sow the main crop. In September pull off the leaves, and give them to the cows, sheep, and pigs. They are moreover not a bad substitute for greens or spinach.

You may calculate on 30,000 plants per acre, and supposing them to average 3 lbs. each, you will have 90,000 lbs., or about 40 tons of firm nutritious food per acre, for your cattle, sheep, and pigs. This is a large produce, but greater has been frequently obtained.

Forty tons of mangel-wurzel will support twelve cows during four months, allowing 60 lbs. to each cow per day; and the manure made by these cows will be greater in quantity, and better in quality, than that produced from the same number of animals kept upon straw or hay. Clean the roots and cut off the fibres, and give them two or three chops with a spade or bill-hook, when you give the roots to your cattle; and occasionally sprinkle a little salt on them at the time they are used. Salt, in moderation, is always good for cattle, with every description of food.

Mangel-wurzel will thrive in any kind of soil, but to grow it in the greatest perfection, a deep friable loam, on a dry substratum, is necessary. It does not strike very deep into the ground, but the roots swell above ground, much like turnips; and stirring and loosening the soil always helps their growth, and keeps their fibres near the surface. Watering the plants during the summer with liquid manure, will greatly promote their growth, and this is carefully attended to by the growers of mangel-wurzel on the Continent.

Mangel-wurzel is regarded as a fallow crop, and like turnips, it takes its rotation among manured green crops; but it requires a good quantity of manure, and may therefore be considered as an exhausting crop. If, however, the land has been well cultivated and manured, it will, after mangel-wurzel, be in as good condition for a corn crop, as after potatoes, cabbages, or turnips; whilst the yield is larger than either of these.

There are three varieties of the mangel-wurzel, the Red, the Yellow, and the Globe kinds. The latter is considered the most productive, and to be equal to the others in all other respects. Mangel-wurzel certainly ought to be included in the rotation, on account of its own merits, as well as for preventing the too frequent return of turnips, as is now the case in the four-course shift. All animals thrive upon mangel-wurzel, and are fond of it; and it is less apt to affect the taste of milk, than either turnips or cabbages, when cows are fed with it.

THE CABBAGE.

Cabbages, form a very valuable description of green food for cattle, throughout the whole year, as successive crops of them, at regular intervals, may always be obtained; and the early York and sugar-loaf kinds, when young, give no unpleasant taste to milk or butter.

There are numerous varieties of the cabbage, known by different names. The larger kinds are usually cultivated by the farmers in England and Scotland, such as the Drumhead, the Oxhead, &c. Cabbages thrive best on a strong deep soil. They will also do well on marshy land, and good crops have been produced on newly reclaimed bog or moss. Whatever be the soil, however, a liberal application of farm-yard manure, or good compost, is necessary; and when the heads begin to form, if liquid manure can be obtained to pour between the rows, it will greatly improve the growth of the plant.

The ground for cabbages should be repeatedly ploughed and harrowed, or, what is better, trenched deeply to the subsoil. If it is intended for a spring planting, let the ground be thrown up in ridges, to be mellowed by the frost during winter. Good rotten dung must be applied at the rate of from twenty to thirty tons to the acre, according to the condition and nature of the soil. The dung may be either dug or ploughed in, or it may be laid in the bottom of the drills immediately before planting, and be covered in by splitting the ridge between the drills, as with turnips, which is in general the better plan; taking care, however, that the last stirring of the ground should be at the time of planting, for cabbages love fresh earth. The root-weeds should be carefully picked out of the ground, before putting in the plants.

In order to raise a crop of cabbages, to come forward early in the spring, prepare a perch of ground in August, manure it well with short dung, and sow half of it with early York, and the other half with sugar-loaf, in little drills, three inches apart, the seeds thin in the drill. As soon as the seeds are up, hoe deeply between the rows, and again in a few days, for the more you hoe or dig about the plants the better; the plants should be thinned, if nearer than two inches. When the plants have attained six leaves, dig up, manure, and make fine, another perch or two of ground; and prick out the plants in rows, eight inches apart, and three inches in the row; hoe the ground between them often, and they will grow up straight and strong.

Early in November prepare the ground intended for the full crop, lay manure between the ridges two feet apart, and turn the ridges over on this manure; then plant your cabbages on the ridges, fifteen inches asunder—here they are to stand for the winter. Watch the slugs, and if any plants fail, supply their places from the bed. If the ground becomes hard in winter, dig it, and especially near the plants. In March dig deep, and as soon the plants begin to grow, dig the ground with a spade, clean and well, going as near the plants as possible, without displacing them. Dig again in April and May (indeed you cannot dig too often), and destroy all weeds, and about the 1st of June there will be cabbages.

The early Yorks will soon become solid, and will furnish food for cows and sheep until some time in September. In March and April sow more early Yorks, proceeding as before directed. Dig up and manure the ground, and as fast as you cut cabbages, plant cabbages. The last planting should be about the middle of August, with stout plants, and these will serve through the winter. Dig often between the cabbages, but do not earth them up, or raise the earth about the stem, as is so commonly done. Digging is useful, keeping down weeds, and enabling the plants more readily to obtain nourishment from the soil.

When cabbages are planted out in autumn to stand the winter, a row of early York and a row of sugar-loaf may be planted alternately. The early York will come first, and you will of course cut every alternate row, and then the plants which are to be put in in the summer will go in the intervals. As the sugar-loaves are afterwards cut away, you may sow Swedish turnips in their place, the ground being first dug and manured.

Endeavour to plant in rainy weather. The distance of planting must in some measure depend upon the strength of the soil, and the size of the variety planted; but it should always be such, as that the ground between them may be dug and kept clean. When the larger kinds are planted, as the Drumhead, &c., two feet between the rows, and eighteen inches between each plant, will be required; while for York and the smaller kinds, eighteen inches between the rows, and one foot or fifteen inches between each plant, will be sufficient.

Cabbages are never eaten on the ground, but are carted off, and given fresh every day. They are relished by all feeding animals, and are not only highly convenient as a substitute for turnips, but also afford an excellent variety and change of food. Cabbages are very nutritious when used with hay, either for stall-feeding or for the dairy. Pigs prefer them to turnips, and they are highly useful for rearing calves.

The practice of feeding milch-cows with boiled cabbages, is strongly recommended. Prepared in this way they afford a nourishing food for cows, and produce an abundance of good milk. Cabbages form excellent food for pigs, by cutting them up with buttermilk or broth, and leaving them for a few days to sour and ferment. This mess is highly relished by the pigs, and is very nutritious.

To save cabbage seed, select a few of the finest specimens, and plant them by themselves, at a distance from other plants of the cabbage tribe; for bees carry the farina from plant to plant, when in blossom, and will thus adulterate the seed, unless care be taken to prevent it, by keeping the seed-plants at a safe distance from all others.

THE CARROT.

The Carrot, requires a deep loose soil. Large crops are often raised on peaty land, but the best soil for carrots is a sandy loam. By whatever means the land is prepared, whether with the spade or the plough, it must be deeply and effectively stirred, to a depth of from twelve to eighteen inches, and it must be rendered perfectly loose and friable, and all the root-weeds must be carefully eradicated. Fine crops of carrots have been obtained on poor soils, by trench-digging to the depth of twenty inches. They succeed well after potatoes or turnips, and this place in the rotation of crops is often chosen for them.

When the land is prepared by the plough, repeated deep-ploughing is necessary; for if the ground be not opened and pulverized to a good depth, the roots will become forked, and send off side-shoots in quest of the nourishment which they fail to obtain below. The deep tillage required, may be accomplished by a trenching-plough following the common one, or by the common one alone, with a good strong team. Three ploughings are mostly found sufficient, where the land has been previously in tillage, but more may in some cases be necessary. The first ploughing should be made to the depth of twelve inches, about the beginning of October; and towards the middle of February, the ground should be turned over a second time to nearly the same depth. In March a third ploughing may be given, in order to the putting in of the seed, and this may be lighter than either of the former ploughings. The Norfolk and Suffolk farmers turn in their manure at this ploughing.

Carrots may be sown in drills, the seed being deposited on the top, in the same manner as turnips; or they may be sown flat, in rows, without being raised on drills; or else they may be sown broadcast. When sown in drills, either flat or raised, they admit of hoeing and cleaning, and constitute a fallow crop, like turnips; but the broadcast system is much practised in

Suffolk, where large crops are obtained ; and the same method is used in the Netherlands, where the carrot is highly valued, and extensively cultivated.

When sown in rows, shallow furrows are made at the distance of twelve to fifteen inches, from centre to centre, and in these furrows the seed is sown. This may be done by a machine, or by the hand ; in which case mix the seeds with a little dry sand, and rub them in the hand to make them separate. When the seed is thus sown, cover it in with a slight harrowing.

Carrot seed is generally sown about the middle or latter end of March, but should on no account be later than the beginning of April. Two to three pounds of seed for drill, and five to six pounds for broadcast, are generally sufficient for an acre. The white, or Belgian carrot is said to be the most prolific, and in some instances to yield as much as thirty tons per acre, and it is equal in all respects to the red for cattle.

Carrots should be taken up with a three-prong fork, like potatoes, about the beginning of November, in dry weather; and the leaves should be cut off close to the root, and given to the pigs or the horses. The roots may then be put into narrow oblong heaps, the tails and heads being packed together, and the whole covered with straw. If taken up when dry, carrots will keep well in these heaps, without any other precaution than defending them from frost. Carrots may be given to every species of stock, and form in all cases a palatable and nutritious food, either in their raw state, or when steamed or boiled.

When given to cows, carrots are found in an eminent degree to give colour and flavour to butter, and whenever this is an object, no species of green-feeding is better for the dairy. To horses they may be given with cut straw or hay; and thus given, they will sustain horses on hard work, and materially improve their wind. They are much used in all veterinary establishments, and are strongly recommended for the stable, by persons best conversant with the management of horses.

THE PARSNIP.

The Parsnip, so closely resembles the carrot in its culture and uses, that in describing the treatment of the one, little is left to be said in reference to the other.—(See last article.)

The parsnip, like the carrot, requires a light rich soil, deeply ploughed or trenched, and well manured. The time of sowing, is in February or March. The quantity of seed, and mode of cultivation, are the same as the carrot. The use is also much the same. The parsnip is, however, stated to be superior to the carrot for fattening cattle, affording meat of the finest quality; and it is much used for that purpose in France, and in Jersey and Guernsey.

The parsnip will withstand frost better than the carrot; and if the soil be dry, may be allowed to remain in the ground during the winter; but it is recommended to take up a portion when the leaves begin to decay, and store them for use. The remainder may be taken up in February, and if preserved in dry sand, they will keep till April or May.

THE POTATO.

The Potato, is originally a native of South America, whence it was brought to Europe by the Spaniards, in the latter part of the sixteenth century: but it was unknown in the British Islands till introduced by Sir Walter Raleigh, from Virginia, in 1584; and from a few roots grown in his garden at Youghal, all the potatoes now cultivated in the United Kingdom are believed to have sprung.

Potatoes cannot be planted too early, if the danger of frost be over, and they thrive in almost any soil, when properly cultivated; but they must not be planted too close, and much will depend upon their being kept clean from weeds, and upon the surface being pulverized by repeated hoeing. A heavy crop must not be looked for, if set nearer than ten inches apart, and if the roots have not a good covering of loose earth to work in.

It is necessary to change the seed frequently, and it is observed, that potatoes from cold wet land, answer best as seed on the lighter and finer soils. Indeed it may be said that the same rule holds good in grain, and produce of every kind. The seed should be changed every year, or every second year at farthest; and if your soil be light, purchase seed that has grown on the strongest land, and the contrary if the soil be heavy.

The potato may be grown on the same land for several years, but it is always most luxuriant in a new soil. In England and Scotland, a crop of oats is generally taken before planting potatoes, while in Ireland they are most commonly planted on the lea, in what are called "lazy-beds," a system which the best cultivators condemn, except it be on wet, boggy, moorland soils. Potatoes require a good supply of manure to ensure a good crop, and return very little to the soil.

For seed, cut off the crown of the best-formed potatoes, by which you will have the earliest and best sets, and the root end is the best to eat. The set should not be less than a quarter part of a well-sized potatoe; and do not choose for seed, potatoes which are too small for eating, as is sometimes done. The seed should not be cut until it is wanted for planting, and when you cut the seed, riddle a little slaked lime or ashes over the sets, which will stop their bleeding, and help to strengthen their growth. When planted, the sets should be laid in the ground with the eye uppermost. On wet boggy land, however, whole potatoes are found to be the safest for seed, and the smaller roots may be selected for this purpose, but not the smallest, or the very small.

The season for planting potatoes, depends on the state of the weather and the soil: if these are favourable, you may plant from the beginning of April, to the middle of May; but late crops are never so abundant or so good as early ones. Ground which has been recently limed, will, with the addition of a little dung, produce an abundant crop; and the best method is, where the manure is short or compost, to plough it in and thus mix it thoroughly with the soil.

The culture of potatoes is in Ireland for the most part performed with the spade, and in England and Scotland by the plough. In whichever way they are planted, it is of the first importance that the land should be freed from weeds and noxious roots, which cannot, as in the case of turnips, be easily removed afterwards, whilst the plant is growing.

In preparing the land for a drill crop of potatoes, a first ploughing and furrowing, as deep as possible, should be given in autumn, and the soil be allowed to lie undisturbed till the following spring. Another ploughing and harrowing across the first furrows, should then be given. The complete pulverization of the soil is indispensable, for upon this the success of the crop will greatly depend. The land should then be laid up into ridgelets, from twenty-four to thirty inches broad, the distance depending upon the probable luxuriance of the stem. The manure is then spread evenly in the bottom of the drills, in the same way as for turnips, and the seed planted on the top of the manure, at from eight to ten inches apart, and the ridgelets then reversed to cover them. This is generally considered as being the most approved mode of planting the potato.

The lazy-bed system, as practised in Ireland, consists in making beds a few feet broad, upon which the seed potatoes are laid, about six inches apart; manure having been previously spread on the surface if it is arable land, or without manure if it is grass land. Trenches are then formed between the beds, with the earth taken from which the seed is covered. After the plants have appeared above ground, they are again covered, and this successive earthing up is continued until the plants come into bloom. This plan is not, however, adopted by the best cultivators. It is only practised by the small farmers, and the cottier peasantry, who are unacquainted with the drill system, by which the benefit of a summer fallow is obtained for the land.

The manner in which potatoes are most generally cultivated in England and Scotland, is by dibbling, in rows from twenty-four to thirty inches apart, the manure being ploughed in broadcast, and the potatoes dibbled in every third furrow. This mode will perhaps be found equal, if not generally superior, to any other in practice. The plant meets with no obstacle in its progress to the surface, the sets or cuttings are never too deeply planted, nor does a dry season take effect upon the manure and the roots, as it is sometimes apt to do in drills ridged up in an exposed position. This method is frequently practised without dibbling, by women employed to follow the plough, and plant the sets in every third furrow; but in this way it is necessary to plough with a shallow furrow, from four to five inches being as deep as the potato sets should ever be planted.

When the plants begin to appear above the surface, the ground should be harrowed, either lengthwise or across; the horse-hoe, hoeing-plough, or hand-hoe, is then to be repeatedly employed between the rows, and the hand-hoe alone between the plants, as may be required. The earth is next to be gathered about the roots of the plants, once, or oftener, as may be found necessary, and all weeds must be carefully taken out by hand; for when the roots have spread through the soil in search of food, it is impossible to introduce either the hand or the horse hoe with safety.

Another mode of moulding potatoes, is as follows:—As soon as the stems are three or four inches above ground, run an exposing-plough as closely as possible to the roots, in order to loosen the earth, which it throws from them into the middle of the furrow. After this operation, weeding is executed quickly and effectually, either by the hand or by a small garden-hoe; and carefully remove all the weeds to the dung-pit. The next moulding is to be in the usual way. To choke up the plants with clay, or hard stiff soil, immediately after their tender shoots appear above ground, instead of loosening the earth, in order to let the fibres strike freely, is very injudicious. In moulding up potatoes with a spade or a hoe, especial care should be taken to loosen the earth about the plants, in every direction, and to clean and pulverize it completely; by which means it will have the advantage of a fallow, while it is yielding a valuable crop.

The foregoing are the usual modes adopted in cultivating the potato; each will have its advocates; but as a method may answer in one place, which will not succeed equally well in another, experience is the test to which the farmer must resort on this as on other occasions, to ascertain the greatest produce which can be obtained at the least expense, keeping the fertility of the soil at the same time unimpaired.

Every mode of cultivation which tends to the fertilizing of the land, will better adapt it for the growth of the potato. The effectual draining, and the deepening of the soil, are peculiarly important for the potato, which delights in a dry, deep, sandy loam, and will never flourish in a shallow, wet, or retentive soil. The process of deepening the soil (after thorough-draining) is performed by the subsoil-plough; and it might be readily effected on garden allotments, and small farms, by deep digging with the spade, as is practised by the small cultivators in Flanders. The land should be dug deep enough to turn up, on every occasion, fresh subsoil, until the active soil is brought to the depth of fourteen to eighteen inches, when it would become like a garden in productiveness.

Recent experiments appear to establish the fact, that the produce may be greatly increased by plucking off the blossoms of the potato, and thus preventing the seeding of the plant, which necessarily abstracts nourishment from the root. The labour of nipping off the flower as soon as the crop is fully in blossom would be trifling, and might be done by children, and would probably well repay the cost. At any rate it might be tried, and afterwards be continued or omitted as the result might indicate.

The potato, like most other plants, is subject to disease, the chief of which is termed the *curl*. The cause of this malady has never been satisfactorily accounted for; and experience has shown, that the only sure preventive is to change the seed frequently.

Independently of the curl, however, great failures have taken place in the potato crops within the last few years, in every part of the United Kingdom. The failure has been greater in certain districts and soils than in others, and in some places it has been confined to portions of a field only. The failure has been ascribed to the seasons, to late planting, to early lifting, to the heating of the seed, to the seed being hurt by cold, to the potato having degenerated in its vegetative powers, &c.; but all is mere conjecture, and it is satisfactory to know that the evil may, in almost all cases, be remedied by a frequent change of seed, as in the case of curl. In 1839, this disease almost entirely disappeared, and never have the potatoes been more healthy than at present, which in all probability is owing to the now almost universal practice of changing the seed annually.

There is perhaps no crop which succeeds so well, through a series of years, as the potato; and in wet seasons, when the grain crop is poor, it is generally most abundant. The potato is deficient in the gluten which wheat possesses, and the ratio of their nutritive qualities may be considered as about four to one. The potato is nevertheless highly nutritive, and meal made from it does not differ essentially from arrowroot, tapioca, and sago. When mixed with wheat flour, it renders bread lighter, more palatable, and easier of digestion; and forms an excellent food for children, and people of weak stomachs. The finest confectionery is made from potato flour; and in France, potato flour is manufactured in large quantities, and with the addition of wheaten flour, is made into biscuits, pastry, soup, gruel, &c., and is extensively used in the marine, the army, and the hospitals.

The manner of obtaining the flour is very simple, and the process may easily be performed in every house. The potatoes ought to be the most mealy which can be obtained, the skins should be taken off as thinly as possible, and the potatoes grated down with a coarse grater. The pulp thus formed should then be washed through a hair sieve, as often as the water has the least colour in it. After the pulp has gone through the hair sieve, it may either be again put through a fine sieve, and then washed, or else be washed repeatedly until the flour is perfectly white. The flour must be carefully dried, either in the open air, or else in the house with a moderate degree of heat. The quantity of flour thus obtained, will depend upon the quality of the root, the mealy potatoes yielding most. Good potatoes are sometimes mixed with wheaten flour, first boiling and mashing them carefully; and in this way they form, when baked, a cheap and excellent article of food.

As potatoes, if left in the ground, are seldom found to decay, we may learn from this not to house them in barns, or gather them into large heaps; but to put them into long shallow pits, and cover them so as to protect them from frost.

RED CLOVER.

The *Red Clover*, is a most valuable plant, and no farm, large or small, ought to be without a crop of it. By judicious management, it will give a daily supply of provender for the cattle, from the middle of May till the end of October. It will increase the quantity of milk of the cows, and add to the quantity and quality of the manure, if cut and used green; and if saved as hay, it will be found more nutritious than that which is made from the natural grass.

Clover succeeds best when sown with barley, but will answer also with wheat and oats; and it is little injured by the pasturing of sheep, or light cattle, during dry weather in winter, provided it is not eaten too close, so as to leave the roots of the plant bare, and open to the action of the frost. If it is intended for hay, it should be cut when it is in flower; you will then secure a good after-growth, which is scarcely less valuable than the hay itself, and will be ready for cutting in autumn.

The agricultural system of the Netherlands rests mainly upon the cultivation of the red clover, which is sown with every kind of grain, as well as with flax. The clover not unfrequently yields a fair crop in the first year; two, or even three abundant crops in the second year; and if allowed to stand a third year, it will yield one crop, and afterwards be excellent pasture for cattle, until ploughed in to receive wheat, which usually follows it.

It may perhaps be supposed by some persons, that the land of Flanders is naturally rich, and peculiarly adapted for the growth of clover; but this is not the case; for the soil of that country is generally light and poor, producing in its natural state little more than heath and fern, and its present fertility has been brought about by judicious management. The top-dressings which are there applied to clover, consist chiefly of liquid manure and ashes, the effects of which are highly beneficial to the crop.

In this country, excellent crops of clover are grown on good limestone soils. It succeeds well in rich loams, which are well adapted to the growth of its long tap-roots. It is in fact suited to nearly all the varieties of soil; and although it loves a soil that is rather tenacious, it will yet do well on land that produces good crops of barley; such land being usually of a light sandy texture.

Clover is mostly grown with a corn crop, for which the ground will of course have received a suitable preparation. If sown at the same time with the corn, the clover seed may be put in just before the last turn of the harrow; but it is better, in sowing clover with any of the spring crops, to roll the ground after the last turn of the common harrow, then sow the clover, and cover it with the small seed-harrow: after which, pick off the stones and weeds, and give another stroke of the light harrow. Or if the clover cannot be sown at the same time as the corn, then the preparation should be—rolling the crop, and covering the clover seed by two scrapes of a light harrow; taking care, however, that the clover is sown before the corn begins to tiller.

If the clover is grown with autumn-sown wheat, harrow the wheat first, then roll it, and afterwards sow, and cover the clover seed with the harrow; but it should be sown before the wheat plants get too strong. Barley is, however, better adapted than any other grain crop for growing clover, it being sown in the spring, at a time best calculated for destroying weeds, and having the additional advantage of a shorter period from sowing to reaping than wheat, or any other grain.

When sown with oats, on the stronger soils, the clover seed is usually put in during the month of March. When sown with wheat, it is lightly harrowed in before the young crop has got far ahead. If with barley, the month of April or beginning of May is the usual season. The sowing is sometimes delayed till a fortnight after the oats or barley has been put into the ground, or until the plants have taken root. If the weather be favourable, the earlier in spring that clover is sown the better, to enable it to overcome drought, and escape insects.

Although spring is, unquestionably, the best season for sowing clover, circumstances may sometimes render it expedient to sow in August, to stand the winter as a single crop; but this should not be done, unless it be rendered necessary by peculiar circumstances. Top-dressing is most advantageously applied to clover, immediately after the first cutting; or if omitted then, it should be done after the second cutting.

Red clover is cultivated for house-feeding or soiling cattle, for hay, and sometimes for ploughing down as manure. It is of great utility as a smothering and fertilizing crop, as it sheds a great quantity of its own leaves; and these, with the weeds and grasses which it smothers and destroys, serve to enrich the land. For soiling, the crop may be cut just before it comes into flower; and as it is cut, the eddish should get a top-dressing of suitable compost or manure. The clover should always be cut pretty close to the ground.

Red clover, if well managed, ought to yield three good cuttings the second year; but it should be ploughed in the third year, after it has been cut once. If sown in July, or early in August, alone, and not with a corn crop, on good soil, you may have a cutting the end of September, or early in October, the first year; but if sown with a corn crop in spring, which is the usual mode, you will not have a cutting until the following May.

For hay, clover ought to be mown immediately the plants are in blossom, in order that the juice and nourishment of the plant may be retained; otherwise the leaves will fall off, and the best portion will be wasted. All early-cut grasses contain more nourishing juices, than those which are allowed to ripen their seed, and are less impoverishing to the land. Hay from old grass will carry on stock, but it is only hay from young grass that will fatten them.

If the clover hay be injured by wet, it should be strewed with salt when stacked, at the rate of about a peck of salt per ton. Its quality will much depend upon the manner in which it is saved. It may be cut when wet, but ought never to be moved from the swathe excepting in dry weather, when it should be repeatedly turned, and made into small cocks; and these should again be formed into larger cocks, before making it up into stack. Exposure to the sun and air, more than is absolutely necessary for drying, extracts the substance, and injures the hay, and the greener in colour it is, the better the quality. In England, where the best clover hay is made, it is always heated in the stack, which gives it additional sweetness; but the heating must arise from the natural juices of the clover not being dried up by exposure to the sun and wind, and not from rain or the damp of the weather, which is always prejudicial.

The main crop the second year, should always be mowed, and given to the cattle at home—not a blade should be pastured, that can be eaten in the stable or cow-house. Feeding at home is preferable with all crops; but to pasture red clover, would be shameful waste. The clover should be given in small quantities at a time, and some hours after cutting, that the fixed air may escape from the stalks before it is eaten: the cattle will else be in danger of bursting, from eating it over-greedily.

Clover may be ploughed into the land as manure, with advantage, particularly on limestone and sandy or gravelly soils. This may perhaps be considered a wasteful practice; but we are told by eminent agriculturists, that it is a cheap and profitable mode of improving exhausted or light soils; and premiums have been given for the growth of wheat sown upon clover lea, the whole of the second crop of clover to be ploughed in the first year.

The quantity of clover seed necessary for a statute acre, is from one to two stone, according to the state of the land; but when ground is perfectly cleaned by a regular course of drill husbandry, one stone will generally be found sufficient. It is, however, only on land well ploughed, and well manured, and in which no weed is suffered to appear, that this smaller quantity of seed ought to be used. The clover plant in such land will tiller uninterruptedly, and possess itself of the whole surface.

The seed may be saved from the second crop; and if the first cutting be in May or June, the second will be ripe in September, which is generally a favourable month for saving the seed.

Without clover for summer feeding, no man should presume to call himself a farmer. An acre of good common pasture will only feed one cow from May to November, but an acre of good clover will support three, and in some cases even four cows for the same period, if fed in the house, by which a valuable supply of manure will likewise be obtained. Indeed, feeding cattle on any grass land is wasteful, in comparison with feeding them in the house: but with clover, it would be wanton and absurd waste.

The profit which store pigs, fed entirely upon clover or vetches, will afford to the farmer, has not been noticed; but it is very considerable, particularly if you can give them at the same time a little buttermilk—even the rinsings of the milk vessels, with clover, vetches, or lucerne, will keep the pigs in good condition.

Of late years there have been frequent complaints of the failure and falling off of the clover crops, and in many instances it has been found that when often repeated, as in the four-years' rotation, it degenerates and diminishes in produce. Various causes have been assigned for this deterioration, and various attempts have been made to remedy the evil, with more or less success. It seems probable, however, that clover requires longer intervals before the soil is again capable of producing it in perfection, than has hitherto been assigned it in the four-years' shift. All the known facts appear to tend to this conclusion, and to point to an extension of the interval, by extending the rotation; which would likewise, in all probability, be advantageous to all the other crops in the series.

By extending the rotation, the soil would have more time to recruit in that description of nourishment, which the clover has abstracted from it, and which is necessary for its growth. With this view, a crop of peas or tares has in some instances been substituted for clover, after the barley crop in the four-year course; and the clover has been sown after the wheat or barley in the next rotation, which makes the interval between the clover crops seven instead of four years; and this change has proved advantageous. Indeed, some persons have contended that clover should have an interval of not less than eight years between one crop and another, in order to ensure an abundant produce.

Clover invariably succeeds well after flax. This fact is well known to the Belgian farmer, who always acts upon it; and it is a circumstance no less curious than important. If we could ascertain with certainty, why some plants grow luxuriantly in company with others, or in succession to others, whilst with plants of a different kind they fall off or fail altogether, a most important point would be established for regulating the succession of crops, on the best and surest basis. Of one thing, however, there can be no doubt, namely —that by thorough-draining and deep-ploughing, by which fresh soil is brought to the surface, and a dry and warm bed is prepared for the seed, every description of crop is improved, and rendered earlier in its growth, and more certain in its produce; and this is perhaps more markedly the case with clover, than with any other description of crop.

AMERICAN COW-GRASS.

The American Cow-Grass, possesses properties in many respects very similar to the red clover, with the advantage of being a perennial plant. It does not, however, usually give so good a crop the second year; and, unless for the purpose of mixing with other grasses for permanent leys, it is never found superior to the red clover. The cow-grass may, however, be a good substitute occasionally, when the land becomes tired of growing clover. If you cannot have either red clover or cow-grass, as may sometimes happen when first entering upon an ill-managed farm, you may sow a crop of vetches, which are always useful.

ITALIAN RYE-GRASS.

The Italian Rye-Grass is extremely valuable, as well for its earliness, as for its great productiveness. It is consumed with avidity by all kinds of stock, and there are now few farms, of any extent, without a supply of it.

The Italian rye-grass, although valuable as an early grass, retains its powers of growth to a late period of the year, as many as four successive cuttings of it having been taken during one season. A patch of this grass, which had ripened its seeds, and was cut in November, on the 24th of December had attained a length of above a foot, notwithstanding some sharp frosts had intervened; thus showing a superiority over any other grass in producing winter herbage.

If sown on wheat stubble immediately the corn is removed, say early in September, it will be fit for soiling in May, and yield nearly as good a crop as if it had been sown in the previous spring; provided the land is dry and in good condition, and that the stubble has been well worked. A little manure at the time of sowing, will be of great use in forwarding the growth and increasing the yield of the crop.

Doubts have heretofore been expressed as to the duration of the Italian rye-grass, but these no longer exist; and the best authorities are now agreed in considering, that it has fully established its character as a perennial plant. About three bushels of seed are required for the statute acre; but it is necessary that the land should be well worked.

TARES, OR VETCHES.

Vetches, or Tares, are a valuable crop, for soiling and feeding cattle, which are fonder of them than clover, or any other green food: but when wet or foul, or too green and succulent, the stock fed on them are liable to violent colics, by eating too eagerly of this enticing food. To prevent this, the tares should be given in small quantities, and alternately with straw or hay.

When intended to be cut green for soiling, the seed sown should be at the rate of three bushels and a half per statute acre, and about a sixth or eighth part of oats or rye will be found a valuable addition to the crop. The seed should be put into the ground at intervals, from the end of March, to the end of May, so as to furnish successive cuttings for the soiling of the stock. The seed may be sown broadcast, or in drills, but the latter is always preferable; and after being harrowed in, the ground should be rolled, to allow of the free use of the scythe.

Loams and strong soils, which are clean, dry, and in good condition, will produce good crops of vetches without manure, as will also light or poor soils, if well prepared. A good crop of vetches may be obtained after wheat, on fertile soils, and the land will be benefited thereby. On light soils, it is advisable to sow vetches after turnips or other manured crops, and then to sow wheat afterwards, by which two good crops will be obtained; whereas, by sowing the wheat after the turnips, the crop is not always better or more certain, and the land would not afterwards produce vetches, without manure.

On land intended for turnips or rape, if it be too wet for winter vetches, sow the spring vetch in February or March, which can generally be gotten off in time for a succeeding crop. When vetches are intended for soiling, the land cannot be too rich and strong; but light dry soils are most suitable, when the seed is intended to be saved.

Two ploughings are generally necessary for spring vetches—the first between Michaelmas and Christmas, and the second immediately before sowing: but care should be taken to clean the land before sowing, as it cannot be so well done afterwards.

The winter vetch is generally sown in September and October, and the first sowing ought to be made as early as circumstances will admit. Successive crops should be sown from the middle of August to the end of October, in such quantities as may be required, to keep up a regular and constant supply of green food for your cattle. There is an early variety of winter vetch, which, if sown in August or early in September, will be fit to cut about the 1st of May, when food is most scarce. This variety is said to yield good crops, and is worth looking after. 2½ bushels of the vetch seed, and 1 bushel of rye, are sufficient for an acre.

The spring variety, if sown in January, in a warm sheltered situation, will generally be fit for cutting early in June, and may be followed by turnips. Other sowings may be made in February, the beginning and end of March, and the beginning of April. That sown in the early part of March will be fit for cutting the middle of July, and that sown at the end of March will be fit for cutting in August. The quantity of seed will depend upon the period of sowing, the nature of the land, and whether it is intended to soil the crop, or to save it for seed. When grown for soiling, a greater quantity is necessary than if the crop is to be saved for seed. Under ordinary circumstances, however, it may be said that from 12 to 14 stone, with about 4 stone of oats or rye, per statute acre, is sufficient for soiling purposes, and if intended for seed, 12 stone will be sufficient.

All farm animals are fond of vetches, and thrive upon them freely, and pigs will fatten upon them. They are well suited for milch-cows, causing them to give a good supply of butter; and they afford excellent feeding for horses.

The winter vetch, if sown in September or October, will be a very valuable food for cattle, particularly for sheep, early in the spring; and the best way is, to cut and carry it to the fields or folds where the sheep are kept. This prevents them from treading upon and breaking the stems of the plants, which they would do if allowed to eat the crop on the ground. For hay, vetches should be cut after the blossom has fallen off, and before the pods have made much progress.

RAPE.

Rape, will flourish on a wider range of soils than the turnip; it requires less cultivation and less manure, and may therefore be grown where the turnip cannot be profitably cultivated. Rape is generally used for soiling, or for feeding sheep; but it is also cultivated for the seed. It is so hardy, that sow or plant it when or where you will, it is sure to make a struggle for existence; and although any particular climate may not be favourable to its cultivation for seed, yet as a green crop for winter or spring feeding, rape is always valuable, yielding an abundant supply of nutritious food, at a season when turnips and mangel-wurzel are usually exhausted, and before the winter vetch, clover, or Italian rye-grass, are ready for use.

One great advantage of rape is, the facility with which it can be produced on inferior soils, on which an early crop may often obviate the necessity of a naked summer fallow; for the rape may be eaten upon the ground by sheep in the month of September, so as to admit of a crop of wheat being sown afterwards. It is also of great use in the process of reclaiming bog, and other waste land. By sowing such lands with rape, and feeding it off with sheep, a proper mixture of useful grasses may be introduced, and the ground be thus brought to a state of permanent fertility.

Rape is particularly valuable to the farmer, affording a crop between harvest and spring. It will often yield a good cutting in October, when the frosts have stripped the clover of its leaves, and before the turnips are fit for use: and will come in afterwards in spring, when the turnips are exhausted, and before the winter vetches are sufficiently forward.

As an intermediate crop, rape may be cultivated in various ways. If the crop which it is to succeed is still on the ground, a seed-bed may be made in June, and the rape can be transplanted out, after the removal of the previous crop. If grown after vetches, the rape plants should be put in, ridge by ridge, as the vetches are cut, giving the ground a dressing of manure; but in a majority of cases, the vetches will be off the ground in time to sow the rape. Rape may in like manner succeed a corn crop, first ploughing and manuring the stubble. In Flanders, where rape culture is practised upon an extensive scale, the stubble is ploughed twice, and the rape plants are covered in by the plough, having been previously laid at proper distances upright in the furrow. This is an expeditious method, and is there found to answer well.

It is usual where clover has not been sown, to take a crop of rape after flax, the flax being always off the ground sufficiently early to allow of sowing the rape-seed, without having recourse to transplanting. In this case, after the flax stubble has been ploughed, and harrowed fine, the manure is laid on the surface, and a slight covering of mould thrown over it from the furrows; the seed is then sown at the rate of 15 lbs. to the statute acre, and covered with earth from the furrows. In this way excellent crops of rape are produced, which give five or six weeks' feeding at the worst season of the year, and the ground is left clear for a spring crop.

Rape may also be sown without manure, on a stubble, on which a crop of turnips could not be expected; for although it may not afford much keep during the winter, yet the manure deposited by the sheep whilst eating it, and the benefit derived from the roots when ploughed in, will be of great advantage to the land.

Rape sown exclusively for its seed, must be kept at a greater distance apart than when intended for soiling, or feeding by sheep. On the poorer soils the plants may be left at eight or ten inches apart, but on rich soils they must stand at twelve or fifteen inches distant. When the crop is intended for seed, the time for sowing is about the middle of August, and for reaping, the middle of July following, provided the season be favourable.

The ripening of the crop ought to be carefully attended to, for it will change very quickly, if the weather be hot, and will probably require to be cut in patches throughout the field. It must also be well watched from birds, as soon as the pods begin to fill. The crop must on no account be allowed to get too ripe, and if lodged, should be cut even under-ripe, in preference to letting it lie upon the ground. It must be reaped with great care, and then put erect in shocks to dry and ripen in the fields. When carried, it must be kept upright, and shaken as little as possible until placed on the sheet: it is then to be beaten out with long poles. Sufficient hands should be engaged for the day it is likely to be fit for thrashing, which requires expedition; as the crop must be carried to the sheet, thrashed, and cleaned, the same day, in order to guard against risk from rain. Should the seed be at all damp, when brought to the granary, spread it thinly on the floor till perfectly dry.

There is no portion of the rape-plant that may not be turned to a profitable account. Its value for soiling and feeding has been already noticed. The seed is used for crushing, by which large quantities of oil are extracted from it; and the rape-cake is very valuable as a manure. In Flanders, the manure from which the rape itself is generally raised, is urine, with the rape-cakes dissolved in it. The pods and parts broken off in thrashing, are as acceptable to cattle as hay; and the haulm or stems may be used as litter, or for the bottoms of stacks, &c. In Holland, the haulm is burned into ashes for manure, which is found to be very valuable.

LUCERNE AND SAINFOIN.

Lucerne, and *Sainfoin*, are each valuable crops. Both should be sown in clean ground, in drills, from twelve to eighteen inches apart, in order that they may be dug between and kept free from weeds. Both are tap-rooted, and require a loose dry undersoil; limestone, gravel, or chalk is the best. They are both perennial, and bear crops for about fifteen years in succession, and stand transplanting well; but if the soil is not kept loose and clean, these crops will soon deteriorate, and be seriously injured.

The seed may be sown in a seed-bed in April, and the plants put out in September, or else early in the following spring, as shall be deemed best in each case. Sainfoin is to be treated in the same way, and is suited to the same kind of soil as lucerne: a wet bottom would ruin either, but they will flourish on light land, if dry and warm. If cut early, they will yield four crops in the year; and an acre will feed four cows, from the 1st of April to the end of November, and afford a good deal of hay besides.

Lucerne and sainfoin thrive best in a dry climate, and require care and attention in weeding and keeping clean; and clover is therefore, perhaps, on the whole, to be preferred as a general crop. Lucerne is nevertheless much cultivated in some districts, on account of its durability, and abundant produce; and for the small farmer it appears to be particularly eligible, whenever the soil is suitable for its growth. A deep friable loam on a dry substratum is the best, and on such soil it may certainly be cultivated to advantage.

Chalky soils are found to be particularly favourable for sainfoin, and large quantities of it are grown in Wilts, Hants, and Dorset, and the other chalk districts in the south of England, where it is held in high estimation by the farmers of every grade.

The land for these crops should be well prepared by trenching or deep ploughing, and a previous fallow, or fallow crop. When a small quantity only is required, it is better to have the soil deeply trenched with the spade, manuring it well at the same time. Deep tillage is indispensable for these plants, which derive their nourishment from long tap-roots, that penetrate the earth to the depth of two and three feet, in quest of nourishment.

If transplanted from seed sown the previous spring, half a pound of seed upon a nursery-bed, four or five feet wide and twenty paces long, will give a sufficiency of plants for an acre. The quantity of seed generally used, when sown in drill, is about twelve pounds per statute acre. The latter end of March, or the beginning of April, are proper periods for sowing. When delayed too long, the plant is apt to be destroyed by the fly.

The first year after sowing or transplanting, there will generally be three good cuttings; the first in the end of May or beginning of June, the second in July or August, and the third in October; and always cut the moment the flower-buds appear. In the second year, the first cutting ought to commence the first week in May; and again, at intervals of forty days, for four cuttings. The third year, and every year after, the first cutting should begin about the middle of April, according to the earliness or lateness of the season; taking care to begin the cutting early, as it is to be continued for forty days, and the latter cuttings would else be too far advanced. There will thus be four or five good cuttings in the year, equal to any crop of vetches, and without waste. After the last cutting, the earth between the rows should be well dug and cleaned, and a little manure would be very useful whenever it can be spared.

There is perhaps no summer crop better adapted for cottage husbandry than lucerne, where the soil is suitable. A quarter of an acre will support a cow from the 1st of May to the 1st of November, and it gives no unpleasant taste to milk or butter. It may be considered a permanent crop, and little labour is required after the first year; and with a few Swedes, and a half or a quarter of an acre of mangel-wurzel, for winter food, it would answer well for the small farmer, and often obviate the necessity for cabbages or other crops.

LAYING DOWN IN GRASS.

The most important preparation for laying down tillage lands in grass, is to clean and enrich the soil; and the general, and perhaps the best mode of doing this, is by first growing a crop of mangel-wurzel, turnips, or drilled potatoes, which are to be well manured, and effectually cleaned and cultivated during summer, so as to eradicate all weeds. The following spring, put in either barley or oats, and when these are sufficiently harrowed, sow the grass and clover seeds, and run them over with a light harrow. Then roll, and if the ground be naturally stiff and adhesive, it may be well to give one turn of the light harrow after the roller, which will prevent the surface becoming hard and caky.

If the land is intended for permanent pasture, one bushel of the common, and half a bushel of Italian rye-grass, half a bushel of cock'sfoot-grass, 3 lbs. of white and 1 lb of red clover, and 2 lbs. of cow-grass, will be a good proportion, and sufficient for an acre; but a little trefoil and rib-grass might likewise be useful.

If it is only intended that the land should be kept under grass for one, two, or three years, the Italian rye-grass is decidedly preferable to all others, and three bushels of this grass, with 2 lbs. of white and 5 lbs. of red clover, will be sufficient for a statute acre. Should the soil be very rich and clean, however, somewhat less seed may suffice; and if the land is poor, and not over clean, a small addition to the above quantities might be desirable.

The above is the most usual way of laying down in grass, but many persons prefer sowing in autumn, after a fallow or fallow crop; and in such case, a crop of early turnips, well manured, and eaten off the land, forms an excellent preparation for the grass-seeds, which, if possible, should be sown in September. They will then be sure to strike, and do well; and will form a good sward early in the ensuing spring. In any case the ground should be well harrowed and worked fine, and after the seed is sown, it should be well rolled, to consolidate and level the surface.

The kind of seed to be sown, must depend in some measure upon the nature of the soil; but too much care cannot be taken to have all the seeds of good quality, and clean and free from rubbish. Perennial rye-grass, cow-grass, trefoil, and white clover, are the kinds chiefly to be selected for permanent pasture; but where it is intended only for three or four years, red clover is the principal plant, with a proportion of the Italian and common perennial rye-grass.

For a field intended to remain four or five years in grass, the following proportions are recommended;—red clover, 12 lbs.; white clover, 6 lbs.; trefoil, 4 lbs.; rib-grass, 2 lbs.; rye-grass, 2 pecks; and cock'sfoot and cow grass are sometimes added. The entire quantity of the mixed seeds, should be from 30 to 40 lbs. per acre, in order to ensure a good close sward of grass the next year.

FLAX.

Flax comes within the definition which we have given of "Green Crops," but it is not usually included with them. It may, however, always form part of a rotation, and it has long been so cultivated very extensively in Flanders, and to a considerable extent likewise in Ireland. No crop affords so much employment, and none better repays the farmer for the care bestowed upon it; and when it is considered what large sums are annually expended in the purchase of foreign flax, whilst our own soil is equal to any for the growth of the plant, its extended cultivation would seem to be an object of national importance.

The best soil for flax is a friable loam—neither clayey nor gravelly, and such as is easily worked. Soil enriched by much manure causes the flax to grow too strong, and come coarse from the hackle. Flax of the best quality is grown after oats, from clover or pasture lea, if the ground has been laid down in good heart. Sometimes good crops are got from wheat-stubble, after potatoes; but it is never desirable to sow flax immediately after potatoes or turnips, when the ground has had a full quantity of manure.

In preparing the ground, be careful to have it deep, fine, and clear of weeds. This can only be done by ploughing twice before or during winter, harrowing effectually between the ploughings, to expose the root-weeds to the frost, and then ploughing and harrowing in spring, a few weeks before sowing, so that the seed-weeds will have time to braird, and be destroyed by the final preparation for the crop.

If the ground be stiff, the roller should be used after the harrow, to break the lumps; then, before sowing, use the small seed-harrow, or one that has short close pins, to level the surface. After sowing, a double turn of the seed-harrow will give sufficient covering—then roll. If the ground is not naturally dry, a water furrow will be necessary. The Dutch sow thickly, by which means they have fine flax; and the stalks bearing only a few pods or *bows*, the seed is all equally ripe; whereas, when thinly sown, the flax is coarse, having branchy tops, with seed unequally ripe.

Too much pains cannot be taken in weeding. This is one great cause of the superiority of the Dutch and Belgian flax; not a weed, large or small, is there ever allowed to remain, and the crop pays well for all the labour bestowed upon it. Weeding should be done when the plant rises about three inches. The weeders will often press it down, by sitting to weed; but they should take care not to twist or *swirl* it, or flatten it different ways; as that cracks the young stalk, which seldom recovers, while by merely pressing it one way it will soon start up again.

The time for pulling, is when about two-thirds of the stalk turn yellow, and lose the leaves. By pulling green, the dressed flax appears finer, but it is weaker, and deficient in weight. When any of the crop is lying, it should be pulled and kept by itself; and care should be taken to sort and keep the long, middling, and short, separate. This is particularly attended to on the Continent, and is a means of enhancing the value to the spinner, and consequently to the grower. Flax should never be pulled when it is wet; and it should lie two or three days in handfuls, or small sheaves, before steeping; and the sheaves should be tied very loose.

The watering should be done with soft water. The best way is to fill the pit from a river or stream, then stop the run and steep as soon as you please; but if you can only get spring or hard water, fill the pit a week before steeping, that the sun and air may warm and soften it. Never let in any fresh water, unless to supply leakage, which should be carefully guarded against. The Dutch set the flax nearly upright in the water, with the tops down; they then cover it with mud, and in some places with boards, in framework, to keep out the light. Clean straw might answer the purpose as well, if pressed down with sods or stones; and the straw would afterwards form excellent manure, when saturated with the flax-water.

Every grower of flax should know when it is properly watered, this being very important in the management of the crop. Directions on this point can hardly be given, as the time necessary varies according to the nature of the water, the state of the weather, and the ripeness of the plant when pulled. The time varies from six or seven, to twelve or fourteen days; and the medium may be near the proper proportion in ordinary cases. Wash the flax in clean water, on taking it out of the pit, which gives it a uniformity of colour.

It may be noticed here, that every barrel of water, from a flax-pit, is equal in value to a cart-load of farm-yard manure, for top-dressing. The flax-water should therefore be carefully preserved for the land, and not a drop of it should be allowed to run to waste.

Every flax-grower knows when it is fit for lifting, which must be done on a dry day, and the drier it is the better. There is much loss in the mill when the flax is not perfectly dry. If not taken soon to the mill, it is improved by putting it into small stacks, loosely built, with bramble or stones at the bottom, to let the air circulate.

Milling and hand-scutching are important operations, which are carefully attended to by the flax-growers on the Continent. Great care ought to be taken in rolling the flax. It should go through different sets of rollers, of varied dimensions in the grooves, from large to small, so that the shove or woody part will be minutely broken; which will make it more easily scutched, and less liable to be wasted, as it is the long unbroken shoves that tear away the flax. The same care should be taken in breaking or crigging the flax, for hand-scutching.

The saving of the seed is also an important consideration. On the Continent, the growers have both good flax and good seed from the same crop. Their general practice is to dry the flax in the field, like grain, and stack it till the following spring. If saved for the oil-mill, the seed ought to be nearly ripe; and this may be permitted without injury to the fibre—the Dutch say with advantage. Whether the seed be ripe or unripe, it will be a shameful waste to allow it to rot in the lint-holes, when it is capable of forming valuable feeding for cattle. There is no other food superior to it, for milk, butter, and fattening: but it ought always to be ground, and with the husk, as the seed alone is apt to purge the animals.

OSIERS.

How much wet waste land is there that might be turned to profit, if planted with *Osiers*, which are so useful to the farmer, and often so profitable for sale? Hurdles, baskets, and a great variety of useful articles, are all made from this little twig; which, although so soft and pliable, is yet hardy in its growth; and it is difficult to account for its not being more generally cultivated and attended to.

The cuttings should be taken from strong healthy shoots, and ought to be planted in February. The land must be kept clean, and tolerably dry, for the first two years; after which, the stocks will support themselves, with little trouble to the farmer: but the osier will not flourish, and should not be planted, in situations where water remains stagnant for any considerable time.

If planted on wet spongy land, it should first have a dressing of marl, clay, or earth, in order to consolidate the soil, and give the osiers a better growth. When well managed, as much as 14*l.* per acre is often obtained from a plantation of osiers, and they are usually cut every third year. The golden osiers are best for baskets, but the common sort are hardier, and answer well for general purposes.

STALL-FEEDING, OR SOILING.

Stall-Feeding, or Soiling, is the feeding of cattle with green crops in the house. Throughout Switzerland and Flanders, a great portion of the cattle are kept constantly in the house, and are fed upon cut grass, clover, and other green food; which is a profitable mode of procuring rich manure, as well as of feeding the milch-cows and other stock.

Young animals requiring exercise, will generally grow better, and acquire more vigour in the open pasture, than when confined in a house or fold; but cows are impatient of heat, "when the sun scorches and the gad-fly stings," and feeding them in the house increases their milk, and the manure is thereby preserved and greatly augmented.

Warmth and rest are necessary for the fattening of all animals, and these essentials are secured by stall-feeding. A bullock fed in the house consumes much less food, and gets fat much sooner, than if fed in the field, the difference probably amounting to one-half in favour of house-feeding. Heat and cold, the variations of the climate, affect cattle in the open field, from which those in the house are protected; and exercise prevents the secretion of fat. This applies equally to sheep, pigs, and poultry, and should never be lost sight of by the judicious farmer.

Working horses or oxen are much benefited by soiling, being thereby saved the labour of collecting their food, after their work is over. They can also fill themselves sooner, and consequently have more time for rest; and they repose much better in a stable or shed, with plenty of litter, than in an open field, where there are so many things to annoy them.

Bullocks, when fed in the house, become more tractable for work, and are saved from many accidents and disorders. The size and symmetry of cattle, thus fed and sheltered, show that stock so kept, will generally surpass those which are exposed to the vicissitudes of climate, and other circumstances inseparable from open grazing, even on the best pastures. Pigs may be soiled on clover with much advantage, and for that purpose alone, there ought to be a small patch of clover in every cottage garden.

In stall-feeding, the food should be given frequently and in small quantities. By a judicious mixture, and regular supply of food, a much greater increase of flesh may be produced than by any irregular mode of feeding, however good the quality or abundant the quantity of the food given may be. To over-feed, is as bad as to starve a beast, and it produces similar effects. On the least appearance of a loss of appetite, the quantity of food must be lessened.

The cattle may have the use of a yard for air and exercise, and when confined entirely in the stalls, they must be kept dry, and perfectly clean. To allow the cows or cattle to sleep or stand in wet, or dirt, would be very injurious,—it would lessen the milk of one, and retard the fattening of the other, and injure the health of both. You cannot be too particular in this respect.

When the diet of cows is suddenly changed from dry food to green, they are apt to injure themselves, at first, by eating too eagerly of the green food; and on this account, care should be taken that they have not too much at once, but that it be given often and in small quantities.

Clover should be given sparingly at first, for if too abundant, or if it be given wet, it is apt to bring on a disease called *hoving*, or swelling. This complaint is supposed to arise from the air generated by the fermenting of the clover in the stomach of the animal; and if assistance is not speedily afforded, it may cause death. Clover should be cut the day before it is given to the cattle, which will generally prevent their swelling; but if this disease should attack them, half a pint of train-oil, an eggful of tar, or a pound of salt dissolved in water, will afford speedy relief. Straw should be given with clover, as fodder, which will correct a tendency to looseness in the bowels.

The advantages which arise from stall-feeding, are very great. The same number of animals may be maintained on the produce of less than half the quantity of land which would be required, if the cattle were allowed to feed in the fields; and this advantage is only secondary to that which is obtained by the great augmentation of valuable manure. The manure collected by soiling in the house and yard, may be used for any purpose, at the option of the farmer; but if the cattle are allowed to feed in the fields, the manure is in a great measure lost or wasted.

To ensure all the advantages of stall-feeding, however, both as respects the health and progress of the cattle, and the collection of the manure, it is essential that the sheds, yards, and stalls should be properly arranged; so as to economize labour, secure the warmth and comfort of the cattle, and prevent the slightest waste of the manure, whether in a liquid or solid state. The urine must be preserved in tanks, and the dung-yard should be deepened and hollowed out, so as to retain all the moisture of the manure, that not a drop may drain away and be lost to the farm.

The practice of soiling cows and cattle, either tied up in stalls or sheds, or fed loose in the fold-yard, is not so general as that of horses; but since it answers for horses to be fed in the stable, there can be no reason why house-feeding should not answer for cattle. Any quantity of clover and other green crops may be consumed in this way, to the great benefit of the tillage farmer, who always needs more manure than can be accumulated from the straw of his grain crops alone; and it is obvious that a much larger quantity may be obtained by this practice, than in the ordinary way, while the quality is greatly superior. The saving of food by soiling is, moreover, fully one-half.

When the cattle are soiled in the open farm-yard, sheds should be fitted up in some convenient part of it, for shelter from the sun and rain. These may be made readily, and at a trifling expense, by driving stakes into the ground, and filling in the spaces between them with furze, or the boughs of trees, branches of the fir tribe being best adapted for the purpose. Sheds formed in this way will answer the purpose temporarily, although if constructed of more substantial materials, they would of course be more durable and complete.

In proof of the advantages which attend the soiling of cattle, we may state, as the result of an experiment accurately made with an acre and half of red clover, that seven milch-cows were fed with the produce for sixty-four days, each cow being supplied with 12 stone of clover daily, making in all 33½ tons of produce from the acre and half of land in the sixty-four days; and the value of the manure which the seven cows so fed and littered produced, was very great. Manure constitutes, in truth, one chief source of the farmer's wealth: yet from a too common disregard or mismanagement of this important element of fertility, what serious loss is every year sustained, not by the farmer only, but by the community at large!

The object of every judicious farmer should be, to improve his own condition, by improving the condition of his farm; and as this cannot be done without manure, and manure cannot be gotten without stock, it becomes a matter of prime consideration how stock can be most economically maintained and made available, and by what management the *largest quantity* of manure can be acquired.

The experience of the best farmers in all countries proves, that by the growth of green crops, such as clover, rye-grass, winter and spring vetches, rape, lucerne, turnips, mangel-wurzel, carrots, and cabbages, the same ground which in poor pasture would scarcely feed one cow in summer, will, under a judicious management of the crops above mentioned, feed three the whole year round, if the cattle are kept and fed in the house; and further, that the manure produced by one of these cows so fed, and well bedded with the straw saved by using better food, will be equal to that produced by three cows pastured in summer, and kept badly littered in winter, with only straw and hay to eat.

If, therefore, three cows may thus be provided with food in the house all the year, from ground which will scarcely feed one under pasture for the summer; and if one cow so fed in the house will afford as much manure as three fed in the field, it follows that any man who may now be able to keep only one cow, would, by adopting this plan, be able to keep three, each producing as much manure as three cows fed in the usual way; and that he will have nine times as much manure by this method, as he would have by the old.

Sixty pounds per day of mangel-wurzel, or turnips, is enough for a cow. Previous to being given, the roots should be washed clean, and cut into large slices; if cut into small, round, or square pieces, there is more danger of choking than when cut in large slices. A little salt scattered on the roots after being cut will be very serviceable, care being taken, however, not to give too much. Indeed a piece of rock-salt for the cattle to lick, will always be useful, and will serve to improve their health and their condition.

In feeding your cows, commence at six o'clock in the morning, with turnips, vetches, clover, or other green food, according to the season; and then give a feed every two hours till night, with a small feed of hay between each; that is, six feeds of green food, and five of hay each day, with hay at night. Two pounds of hay will be enough at each feed, and four pounds at night, which makes fourteen pounds in the twenty-four hours. The cows should get water twice a day. No mention is here made of lucerne, mangel-wurzel, rape, cabbages, or rye-grass, all of which are used for stall-feeding; but they are each spoken of under their respective heads.

In soiling, the cattle should always have abundance of good water, and a careful person should be appointed to attend to them, and supply them with fresh food regularly. Vetches or rape, sown at different times, to be cut in succession when the clover fails or becomes over-ripe, are highly useful, as the dairy cows will otherwise fall off in milk. In Holland, the cows fed in the house are supplied with water mixed with oil-cake, rye, or oatmeal; and they are allowed a supply of salt, which conduces to their health, and improves the quality and increases the quantity of the milk.

All the straw produced on the farm belongs of right to the cattle, and where turnips and other green food are provided, it is chiefly used for bedding. The additional quantity of straw which will be raised on the farm, by means of the increased quantity of manure obtained from the cattle, will keep pace with the number of animals, and provide the bedding required for the stock.

Some well-informed people have estimated the quantity of ground necessary to supply food for a cow, the year round, at only half an acre; and the late Mr. Cobbett said that a quarter of an acre would be sufficient; but it may not be safe to rely altogether upon either of these estimates. It is nevertheless certain, that stall-feeding may be practised with great advantage to the farmer, and more especially to the small farmer; and how wrong is it therefore to allow two or three acres of land to be wasted in grazing one animal in summer, and to have her pining all the winter upon hay and straw? In fact, the farmer would profit more by his cows, if he fed them upon green food in the house, paying a fair rent for the land, than if he kept them in the usual way upon grass, hay, and straw, and got the land for nothing.

The cows, when kept in the house, must be carefully curried and cleaned, which is absolutely essential to the animals' health, and will materially increase the quantity of milk. Too much pains cannot be taken in this respect. All stall-fed cattle should, in fact, be dressed and curried as carefully as a favourite horse. You cannot handle and familiarize your milch-cows too much, or treat them too kindly; and, indeed, the same may be said of all your cattle.

Do not allow the chaff of the corn to be lost. If the cows are confined to dry food, at any time, the change from grass or green crops is apt to affect them; the dung gets dry, the coat stares, and from the costive state of the bowels diseases ensue, which sometimes end in the death of the animal. Now chaff is the best remedy in such cases, if well boiled and mixed with potatoes mashed, and some seeds or bran to make it palatable. A bushel given in this way, night and morning, will open the bowels, make the skin look sleek and healthy, and increase the quantity of milk. When corn chaff cannot be had, the chaff of hay or straw may be substituted. The mixture should be of a consistency to be easily stirred about with the hand. A greater quantity of potatoes may be given with advantage in this way, than in any other; but they must be boiled separately, for potato-water is injurious to cattle. The mixture is improved by some Swedish turnips, which may be boiled with the chaff.

Bean haulm, and any kind of hay or straw, will serve for being cut into chaff, for horses and cows and cattle. Given in this shape, it greatly economizes the food, and is good for the health of the animals. With a chaff-cutting machine, the labour of preparing the chaff is trifling.

It may perhaps be imagined by some persons, that cows will give more milk when pastured in the field, than when fed in the house. This is altogether erroneous, for the less fatigue a cow has to undergo, in obtaining her food, the more milk will she yield; and the practice of leaving cows out in cold nights, or exposing them in summer to the heat and flies by day, is certainly injurious. In mild weather they may perhaps be left out, if unavoidable, without injury: but whenever circumstances admit, let the provender or grass be carried home, and given to the milch-cows within doors, leaving the young stock to pasture in the fields.

It has been estimated that the manure of one cow, fed and littered in the house, is sufficient to top-dress an acre of land; whereas the dung of cattle, if left upon the grass, is injurious; for it prevents all growth for a time, and afterwards raises tufts of coarse herbage, which cattle will not eat. The greater portion of the dung dropped in the fields, goes off in evaporation, and is totally lost; and grubs and flies are generated in and under it whilst it remains: but if it were collected, and spread at the proper season, it would improve the vegetation, and impart fertility to the soil.

In Switzerland, in very elevated situations, where corn does not ripen, the Swiss farmers, who depend chiefly upon the produce of their cows, have the finest cattle, owing to the care taken in crossing the breeds, and attending to the dressing and feeding of them regularly within doors. Land which would, from its steepness, be only pastured by sheep or goats in this country, is there irrigated, or top-dressed, and constantly mowed, to feed the cattle in the house, where they are regularly supplied with fresh grass; and the quantity of dung thus obtained, for top-dressing the grass lands in the spring, keeps them in a high state of fertility. The same practice prevails in the flat countries of Belgium and Holland; and these are examples well worthy of being followed by the British farmer.

WEEDING.

Weeds are the farmer's plague, all lands being more or less infested with them. They are of three kinds—annual, biennial, and perennial. The first live only for one year, and are easily destroyed by fallowing and hoeing in summer. Care must be taken, however, that the operation is not delayed so long as to allow them to shed their seed, or even run to flower, which impoverishes the land. The biennials must be cut off repeatedly, and from time to time, as they successively spring up, and be thus prevented from seeding, by which means they may be speedily got rid off. But perennials are more difficult to eradicate, for merely cutting them off as they show themselves above ground, is not sufficient. Nothing, in short, but repeated ploughings, and picking off the roots by the hand, with a fallow, or succession of fallow crops, will effectually clear the land of perennial weeds.

Thistles are biennial, and may be destroyed by cutting them just above ground, three or four times each season; or they may be pulled up by hand, or with weeding tongs, with which a boy will pull a large heap in a day. It is better even to destroy a little corn, by sending children into it to cut or pull up the thistles, than to leave them to gain strength, and shed their seed.

Ferns, are destroyed by repeated mowing, especially if done early in the season, before they come into full leaf: but if there is any useless patch of broken ground on the farm, the ferns may be allowed to grow on it for litter or bedding for the cattle and horses. Ferns may thus be made a useful substitute for straw, and when so used, they also form a strong and durable manure.

Docks, must be dug out by a long, narrow, double-pronged spade. With such an instrument, used for an hour or two each day of July and August, before they come into seed, you might in two or three seasons eradicate every dock from your farm.

Ragweed, is a biennial, and must be destroyed by cutting before it comes into flower; one head, if allowed to seed, will sow a whole field. The old maxim, that—

> "One year's seeding
> Makes nine years' weeding,"

being verified in this, as in most other kinds of weeds.

Knot-grass, or *Switch*, or *Scutch*, can only be effectually gotten rid of by hand-picking; and even when the last harrowing is given after sowing, or the potato and turnip drills are formed, women and children should be employed to go over the ground with baskets, if it be at all infested with this very troublesome weed, and pick up the small pieces that may have been left, as every bit will grow.

Spurry, though only an annual, is a most pernicious weed, and destroys young clover by choking it when the plants are tender. It is to be got rid of by lime, and resting the land for two or three years in grass, or by having recourse to hand-picking and hoeing. This weed is generally observed in over-cropped lands.

Charlock, or *Wild Mustard*, is a great infester of corn land, and is seen everywhere spreading its bright yellow flower early in the summer. There is no way of getting rid of it but by hand-weeding; and when the corn is about a foot high, women and children should be sent into the field to pull up every root of the charlock, taking care to trample the corn as little as possible; and this should be repeated as often as the weed appears. By persevering in this course, you will at length conquer the enemy, and secure clean crops.

Crowfoot, and *Sheep's Mascorn*. The same rule holds for eradicating these weeds as are above given for knot-grass,—hand-weeding is the only remedy, and the smallest bit ought to be picked off; for in a single year it will form a strong plant, and choke your crop, and make the weeding next year doubly difficult.

Not only ought the weeds in the arable lands to be attended to, but those in the grass land and hedges should also be carefully extirpated; for their seeds are carried by every breeze over the neighbouring fields, and your labour will be useless unless you cut down every thistle, dock, and rag-weed plant, as soon as they come into flower or before. Not a weed should be allowed to appear in any part of your farm, to steal nourishment from the soil; and then the whole of its powers will be applied to the support of the crops.

By careful weeding you will not only promote the growth of the crops, but you may likewise provide manure for the following season. All the weeds should be collected into a heap, and as soon as they begin to sprout, turn them over, putting what was outside at the bottom; repeat this till they have rotted, and become thoroughly decomposed into a fine mould, which is equal to the best dung. Your children and servants should be taught never to pass a weed, either in the field or on the road, without rooting it up, and carrying it to the heap.

FENCES.

Every field must be surrounded by a fence, which is alike necessary for its protection, whether it be arable or pasture. Fences serve likewise to shelter the land in severe weather, and greatly help vegetation, for no crops thrive so well on open and exposed plains, as in enclosed and sheltered lands.

Fences are made in various ways,—palings, stone-walls, turf-banks and dikes, and thorn or quickset hedges, are all used in different parts of the country; but the latter are by far the most general, and except in certain situations they are by far the best. The thorn hedges afford more shelter than any other, both to cattle and crops, and greatly improve the appearance of the country; more especially if there are a few hedge-row trees, at intervals, which is commonly the case in England.

There is no more certain indication of industry and careful management in a farm, than having the fences in good repair, and the gaps neatly closed; whilst their being only half mended, or stopped up with a cart, or a plough or a harrow, or any other makeshift, is a sure indication of bad and slovenly management.

Before the quickset or thorn is planted, the ground should be trenched, and the turf laid at the bottom, and every root-weed be carefully picked out; and it should afterwards be hoed and kept clear from weeds, or the plants will not thrive or thicken at bottom. The season for planting is either early in the spring or late in the autumn, it is not very material which, and the farmer may choose his own time according to the other work in hand. The plants should be set four inches apart, and the usual mode of forming the fence is ditch and hedge, the earth taken from the ditch forming the mound for the hedge. The roots of the thorn do not naturally strike deep into the soil, but rather spread near the surface, and they should not therefore be covered deep, or overloaded with earth, or they will not thrive, but become stunted. If the land is in tillage, it will not be necessary to protect the young fence; but if in grass, a post and rail, or other guard, must be put up to keep the sheep and cattle from eating the young shoots, which they will else be sure to do.

It is obvious that the ground occupied by the fences on a farm, is not available for grazing or tillage, and the farmer should therefore be careful in forming his fences, to have as little of the land thus occupied as possible. The larger the enclosures, the less of course will be the waste of ground in fences, and a straight fence occupies less ground than one that is crooked. In the ploughing of a field, moreover, there will be a material saving of time and labour, and the work will be better done, if the fences are straight; and if there is a good length of furrow, fewer turns of the team will be required.

The size of the farm must in some measure regulate the size of the fields, which ought to be as large as they conveniently can be, and of a square or oblong form, the fences running straight. Where a field is disproportionately small, or where the hedges are crooked and irregular, the labour and cost of removing a fence in the one case, and of straightening it in the other, will be well repaid by the ground which will thereby be gained. It may moreover be remarked, that the earth accumulated in old banks and hedges is highly fertilizing, and forms an excellent top-dressing for grass lands.

Except in very bleak and barren situations, quickset or hawthorn hedges form the best kind of fence; care being taken in planting, and keeping them clear from weeds, and also in trimming them as they grow up. The thorn is a hardy plant, and if cleaned and properly trained when young, and regularly cut when matured, it forms a beautiful fence, and is better adapted for the purpose than any other plant.

In high exposed situations, however, with cold moorish soils, and on hilly land composed of pulverized granite, thorn hedges are seldom found to thrive. In such situations, the beech has proved superior to every other plant, either as an assistant or a substitute for the thorn. The beech will retain possession of the soil, and continue to thrive, when thorns decay or die out; and when regularly and judiciously cropped, it forms a compact fence, which few animals will attempt to break through.

As a hedge-plant, the beech will thrive in any climate or soil; and it retains its leaves during winter, giving warmth and shelter in that bleak season, besides being highly ornamental. This is exemplified in the fences formed of late years, in the higher and more exposed districts of Scotland. The thorns planted were found to die out; various plants were tried as substitutes, such as birch, hazel, willow, privet, &c.; but ultimately, it was found, that none were so well adapted for this purpose as the beech. In a hedge which was planted fifty years ago, composed of two thorns and one beech alternately, upon a thin moorish soil in an elevated situation, the thorns have all died, and the hedge, now consisting entirely of beech, is at present equal to any for strength and beauty.

Every unnecessary ditch on a farm is so much land lost, and care should be taken to have as few of them as possible. The loss of land caused by every useless fence is obviously great, reckoning the space between the trench or gripe, and the back of the ditches, together with that lost by the crookedness of the line,—all which would be saved if the ditches were levelled, and the fences straightened.

Furze, or gorse, sown on the top of turf-dikes, make a good fence, and will grow best if some gravelly earth or sand be mixed with the turf when the seed is sown. Furze have a rugged appearance if neglected, but they may be cut and kept neatly trimmed, and with a single rail on posts two feet high, placed amongst them, on the top of the dike, an excellent fence is formed; whilst the young shoots, if cut off and chopped small, will be found very useful as food for horses, cattle, or sheep.

If stones are abundant, they will form the most durable enclosures of any, although stone fences do not afford the same degree of warmth and shelter to the land that hedges of thorn or birch afford, neither have they the same pleasing appearance.

Trees are objected to in hedges, as being injurious to the crop on each side of the fence, as well as to the fence itself; but trees afford great shelter from the wind, and in summer serve as a refuge for the cattle, when annoyed by the sun and flies. A few trees in the corners of the fields, and at intervals in the hedgerows, are at once ornamental and useful; and as shelter to the farm-house and offices, and to the garden and the orchard, they are indispensable.

ROADS.

Good roads are of the utmost importance to the farmer. Without the means of communication by roads, a country is hardly habitable, and the expense of making a good road, is often covered by one year's saving of time, and wear and tear.

In forming roads in hilly countries, they should be kept to a level as nearly as possible, by winding round the hills, rather than crossing them. The former is often nearly as short, and is always much easier for the cattle. A long-continued dead level is, however, fatiguing to cattle, the same muscles being always employed in the draft; whilst on a road having gentle rises and falls, the different muscles are alternately rested and called into action.

If there be a thin stratum of soft soil where the road is to be made, pare it wholly off; but if it be deep, as in bog or moss, it will form a good elastic foundation, and may be left, cutting deep drains on each side to make it perfectly dry; then cover it over with a layer of turf, before putting on the gravel, or broken stone, which should be laid on pretty thick, excluding all stones above the size of an egg.

All roads should be raised a little in the centre, so as to give them a gentle fall on each side, for the rain to run off freely. A width of fifteen feet will allow two carts to pass, which is sufficient for merely agricultural purposes, although double that width is necessary for a common road. Make open drains on the upper side of the road, if it runs along a slope, and let them be carefully kept clean to carry off the water. Fill up all ruts and holes as soon as they appear; and when the road passes over bog, open all round the hole till you reach where the covering of turf appears sound; then join a new covering of turf to the old part, and re-cover with stone or gravel. Without first laying on fresh turf, the putting on stone or gravel will be useless, as the materials would sink into the bog.

The state of the roads is well deserving the attention of the farmer, whose teams will suffer if they are not kept in good repair; and he should therefore not be backward in doing what is necessary himself, and in urging others to do the same, for keeping them in a proper state. The art of road-making is now so well understood, that it does not seem requisite to give any special directions on the subject; it is sufficient to say, that roads can only be made, or kept in a proper state of repair, by the application of hard durable materials, such as broken stones, flints, and gravel: good roads cannot be made with earth or mud.

ORCHARDS.

In certain districts, the orchard constitutes an important appendage of a farm, on account of the cider which it yields for the use of the farmer and his work-people, as well as for sale. The principal orchards in England are found in the counties of Worcester, Gloucester, Monmouth, Hereford, Somerset, and Devon. In the two former counties, pear-trees are likewise extensively planted for the production of perry, whilst in the latter the apple is chiefly cultivated for making cider.

An orchard requires a deep soil, but it should not be wet or springy. A bank, or gently rising ground, is better than ground that is low and flat; and it ought to be well sheltered from the northerly and north-westerly winds, and, if possible, be open to the south and south-east. The situation should be dry, for where fogs and damps prevail, the blossoms are more liable to be injured by frosts in spring, and the trees become mossy, and soon decay from excess of moisture.

Young apple and pear trees should be planted early in autumn, as soon as their wood has become ripe, and their leaves begin to fall. They will then make fresh roots before the winter sets in, and be prepared to push forth young shoots with more vigour in the spring. They may be planted at about ten yards apart, a little more or less according to the character of the tree, and the nature of the soil. They will require to be watered the first year, if the spring and summer are dry. The young trees should be attended to during their growth, and pruned as required, to prevent their branches crowding and running cross. If this is properly done, the trees will rarely require anything afterwards, and the cutting of old trees is apt to be injurious.

It is very important that the orchard should be open to the sun and air, and that the trees, whether apple or pear, should not be planted too close together. All moss and misletoe should be removed from the trees, and the ground should be kept free from weeds and rubbish.

The pear requires a lighter soil than the apple, and this should be attended to in selecting the site of an orchard. The pear-tree is of stronger growth, and less liable to be broken and injured by storms, than the apple, and may therefore stand in the more exposed aspects, or be planted as a belt round the orchard to shelter the apple-trees.

CIDER.

Apples of different kinds ripen at different times, and earlier or later according to the season; but in general, the principal crop attains maturity about the middle of November. Collect the fruit as it falls, and what remains on the trees should be shaken or gathered, and piled into heaps, each sort by itself, and there be allowed to remain till the apples become mellow and ready for the mill.

The cider-mill usually consists of a circular stone trough, about 18 feet diameter, round which a heavy stone roller is turned, by a horse harnessed to a pole passing through its centre. The fruit is put into the trough, and when completely ground down into a pulp that will pass without lumps through the fingers, it is placed under a press, either in coarse horsehair cloths, or between alternate layers of reeds, the outer ends of which are doubled back to prevent the pulp or "must" escaping. The pressure is sometimes applied by screw and sometimes by lever, and it must be continued until the whole of the juice is extracted.

The liquor is received into a flat tub, from which it is poured into casks placed in open sheds, and there allowed to ferment; and when it has become clear, by the thick muddy matter sinking to the bottom, it is "racked," or drawn off into other casks, but not bunged up.

In the making of cider, it is necessary to be careful in selecting the fruit, for its quality will in a great measure depend upon proper sorts of apples being ground together; and for this, experience is the only guide. Another important matter to be attended to is the fermentation. If this be too slight, the liquor will be thick and unpalatable; if too rapid, its strength will be impaired; and if it be excessive, the cider will be sour, harsh, and thin. The latter is the evil of most frequent occurrence, and whenever excess of fermentation is observed, no time should be lost in racking the liquor off into another cask, which is the only sure remedy; and this it may in some cases be necessary to repeat two or three times.

Early in January the cider may be removed into cellars, but it is not usually bunged down until March; and it may be used in a month or two after, although it is always greatly improved by keeping. The quantity of cider consumed is very considerable, especially during harvest time, it being the usual beverage of the agricultural labourers in the West of England; and it is moreover extensively used as an article of luxury by the middle and upper classes throughout the country.

LIVE STOCK.

Having described the agricultural operations connected with the management of the farm, we will now speak of the live stock necessary to be kept upon it; for without a proper amount of stock, the farmer cannot make the most of his land, or obtain a sufficiency of manure for its profitable cultivation. The selection and management of his live stock, will therefore always form an important object of consideration with the judicious agriculturist.

The live stock proper to be kept on a farm, must depend on its size, and the nature and proportions of its arable and pasture land. The number of horses should be proportioned to the quantity of work to be performed. If too few, the work will be imperfectly done, or at improper times; if too many, they will lead to waste, and eat up the profits of the farm. To fix on the exact number, neither too many nor too few, must be the object of every farmer.

It was an old practice to divide a farm into so many ploughs, or plough-lands, that is, as much land as could be cultivated with one plough; and when there were several of these, it was found useful to have an odd or spare horse for every two ploughs, to relieve the others occasionally. There seems to be little room for improvement on this practice; and as a pair of horses are now generally held to be sufficient for a plough (except perhaps in the case of very heavy adhesive soils), it follows, that for every two ploughs a fifth horse should be kept. The odd horse will be found useful in various ways, and will well repay the cost of his keep, by ensuring greater regularity in carrying on the work of the farm.

With respect to cattle, cows, and sheep, the number of each proper to be kept, must of course vary in every case, and no general rule can be laid down on the subject. It is obviously of great importance that the largest quantity of these descriptions of stock that the farm is capable of properly supporting, should be kept, as well on account of the profit which they will yield, if rightly managed, as for the sake of the manure which they afford: but it is even of greater importance that the land should not be over-stocked, which would inevitably lead to great mischief, and serious loss; and no point calls for more consideration and judgment on the part of the farmer than this.

CATTLE.

The rearing, selection, and feeding of cattle, constitute a very important branch of the farmer's duties, and much of his success will depend upon the correctness of his judgment, and his judicious management in this respect.

There are certain essential points, without which no animal, whatever its other apparent merits, will be found in the long run to answer. These are a wide deep chest, a round well-formed barrel, strong and straight spine, the hip-bones well separated, and a good length of quarter—all of which are necessary for the perfect and healthy performance of the various bodily functions of the animal. In addition to these, it should have a thick, loose, pliant skin, well covered with silky hair to ensure warmth, whilst its soft loose feel indicates a good quantity of cellular substance underneath, for the ready accumulation of fat. The legs should be short and strong. The eye should be clear, full, and mild, indicating a healthy circulation, and a gentle temper. This is very important, for an animal that is quiet and not easily disturbed, will fatten rapidly, while one that is restless and impatient, will be slow in acquiring flesh.

There are various breeds of cattle, all differing in some degree from each other, but all possessing qualities which are held in high estimation in certain districts, and by certain breeders of stock. The most usual mode of distinguishing the breeds, is that of dividing them into the long-horned or Leicestershire kind, the middle-horned or Devon and Hereford kinds, the short-horned or Dutch kind, and the Polled kind, which is altogether without horns.

The long-horned, is a large and rather coarse animal, and is not now so highly esteemed as it has been heretofore. The cows are generally bad milkers, and this breed is gradually giving place to the short-horned, which answers well both for the dairy and for feeding, and is daily becoming more popular and more extensively raised.

At the head of *the middle-horned*, we must place the Devon and the Hereford breeds. Each of these is a very valuable description of stock, especially the Hereford, which, taken altogether, perhaps stands second to none in quality, either for the dairy or the shambles. It is somewhat larger and hardier than the Devon, and the cows are generally better milkers. The Devon is, however, a very valuable breed, round, compact, and beautiful in form; and, on good pastures, easily fattened.

The short-horned, is a highly improved breed, obtained by crossing with the Flemish and Holstein kinds, and is deservedly held in great repute. There are several varieties of the short horns, one of the most generally approved of which is the Ayrshire. The Ayrshire cow feeds well, is very quiet, and a good milker; but, indeed, this may be said of nearly all the varieties of the short-horned kind.

The Polled or *Galloway breed*, is hardy and valuable to the grazier. They are generally black, have small heads, broad straight backs, round roomy bodies, broad loins, long and deep quarters, and short legs; and no cattle fatten more readily, or yield better beef.

In addition to the foregoing, it may be remarked that *the Alderney* and *Jersey kinds* afford very rich milk, but they are tender, and require more care than our hardier breeds. *The Kerry*, or *Irish kind*, is small, but very hardy, and well adapted for the small farmer, and for wild hilly districts. A cross with the Ayrshire would probably be found a great improvement to this breed. The Scotch and the Welsh breeds of cattle are purchased in great numbers every year by the English graziers, who find them to answer well for fattening in the rich pastures of the South.

To be overstocked with domestic animals, is a great error on the part of the farmer. The consequence will be,—barrenness in his cows, which will hardly bring him a calf in two years,—miserable prices for his young beasts,—his sheep dying from disease,—and his horses hardly able to drag through the spring and harvest work. The only remedy for such a state of things is to diminish his stock, by selling off the inferior beasts. The farmer should always part with his over-stock, at the current price of the season, whatever it may be; for by keeping an over-stock of one or two animals, because they will not fetch within 5*s*. or 10*s*. of what he considers a proper price, the value of every other animal upon the farm is diminished; and if this course be pursued for a few years, the whole stock will be ruined, as well as in all probability the farmer himself.

The selection of good males for the improvement of the breed, is an object of the very first importance with respect to stock. Without attention to this, all animals deteriorate, even in the most favourable situations. A constant infusion of new and good blood is absolutely necessary; and the farmer must be particular in his choice, nor grudge additional expense for obtaining good males, for it will be repaid with interest. Thus on a farm, or on any number of small farms, on which there are altogether say as many as fifty cows, of middling quality, the stirks got by an inferior bull would probably not fetch above 1*l.* each, or 50*l.*, whereas, if got by a superior animal, they would probably bring 2*l.* each, or 100*l.* It is the same with respect to rams, stallions, and boars; and as small farmers cannot generally keep good bulls or stallions themselves, they should search for the best in the neighbourhood, and pay for their use, rather than send to a bad one for nothing.

Always give a preference to the male from a stock of acknowledged excellence, even although he may not be so large, or so showy as another animal from an inferior stock; for good blood is sure to tell in the long run. Size must not however be altogether disregarded, and there is no truth in what is sometimes said, that small cattle only are fit for steep hills; for the finest and heaviest cows in Europe are reared and fed upon the mountains of Switzerland, which are higher and steeper than the most hilly parts of Great Britain. You should choose your males therefore of a good size, as well as of a good stock.

A great deal may be done by landlords in improving the breed of stock upon their estates, by procuring bulls, rams, and boars of good breeds, for their tenants' use, at a moderate rate of charge; and in whatever way the subject is considered, the landlord could not fail, in the long run, of being benefited by this practice.

In purchasing cattle, the age ought always to be ascertained, and the surest mode of doing this is by examining the teeth. A calf has usually two front teeth when it is dropped, or in a day or two after. In a fortnight it will have four; in three weeks, six; and at the end of a month, eight. These are the milk teeth; and they will gradually be replaced by the second or permanent teeth. At two years old the two middle teeth are replaced. The next year there will be four new teeth. At four years there will be six, and at five years the whole eight will be replaced. After the animal is six years old, the edges of the teeth begin to wear flat, and the width of the teeth is diminished, leaving interstices between them. At ten, the four middle teeth are considerably diminished, and the mark is worn out of them. After fifteen, few cows can keep themselves in condition by pasturing; but they may continue to give milk, or be fattened, by stall-feeding and giving them steamed and ground food.

Horned cattle have rings at the root of the horns, by which the age may likewise be known. The first ring appears at three years of age, and a new one is formed between it and the head of the animal every year after: but this is not so certain as the teeth, the rings being easily filed off,—a trick sometimes practised by dishonest dealers.

THE COW.

The Cow, is the most useful of domestic animals. She supplies us with milk during her life, and there is no part, whether flesh, tallow, bones, hide, or horns, that is not made serviceable to our wants when she is dead.

The domestication of the cow has effected a material change in the constitution of the animal, and caused her to yield a much greater quantity of milk than she would do if in a wild or natural state. The tendency to secrete milk may be increased by careful and frequent milking, of which every dairyman is aware; and he is also aware that if a cow exhibits a disposition to accumulate flesh and fat, she is never a good milker.

The quantity of milk varies according to the season and mode of feeding, but a good cow of the short-horned, Hereford, or Devon kinds, if well kept, will generally yield from two to four gallons a day, on an average, throughout the year.

It takes a little more than two gallons of milk to make a pound of butter, and about 26 gallons of milk will give a stone (14 lbs.) of cheese. These quantities are of course not strictly accurate, much depending on the character of the animal, the pasture, and mode of feeding; but they may be regarded as approximations, and so far serve as a kind of guide to the farmer. A cow may be safely milked to within a month of her calving, if well fed; but it is better that she should be dry before the new milk begins to spring in the udder.

Select your cows from a well-known stock, and rear the best-formed and most promising calves for your own use. Keep them well whilst growing, both in winter and summer, for if stinted in food, they will never make good cows. Indeed, no animal that is pined in its rearing, will ever become perfect in size or form. Poor feeding is ruinous to every description of stock. A heifer may be put to the bull at fifteen or eighteen months old, and the best time for first calving is in May, when the grass begins to be plentiful and succulent.

If of a good kind, you may raise your cows, generation after generation, from your own stock; but to prevent falling off in the breed, the bull must be changed, and not be put to the same cow more than two or three years running. On the proper selection, and the frequent change of the bull, the character of your stock will mainly depend, and to this essential point too much attention cannot be given by the farmer.

Where house or stall feeding is not practised the year round, the cows should be housed at nights, and fed with green food, by which means the urine and dung will be preserved for the farm, and the milking will be better accomplished than in the fields. The cows will also be in better health, and will give more milk. In bad weather, or when the sun is very hot, it will likewise be of advantage to keep the cows in the house.*

Calves thrive better suckled by the cow, than when fed by hand; but if sufficient milk cannot be spared, they should have whey and peasmeal, or oatmeal porridge and milk, which is extremely nourishing. A starved calf will never make a fine beast, however well fed it may be afterwards, or however excellent the breed may be.

The points to be looked for in a cow, are:—Breadth and length of back; short legs; length of side; small head, fine soft green or yellow horns; a thick strong coat; the skin loose, soft, and silky to the touch; and the tail thin and fine.

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* See Stall-feeding, p. 141.

The following are excellent marks by which to choose a cow:—

"She's long in her face, she's fine in her horn,
She'll quickly get fat without cake or corn;
She's clear in her jaws, she's full in her chine,
She's heavy in flank, and wide in her loin.

"She's broad in her ribs, and long in her rump,
A straight and flat back, with never a hump;
She's wide in her hips, and calm in her eyes,
She's fine in her shoulders, and thin in her thighs.

"She's light in her neck, and small in her tail,
She's wide in her breast, and good at the pail;
She's fine in her bone, and silky of skin,
She's a grazier's without, and a butcher's within."

THE HORSE.

Whenever the land occupied exceeds a few acres, it will be impossible to carry on the operations necessary for its cultivation in a proper manner, without the assistance of animal labour; and the most useful assistant to the farmer is the horse. In some situations, oxen are preferred to horses; and where the farm is small, and situated near a common, on which they may occasionally be turned, oxen may perhaps be used with advantage: but on a larger scale, and as a general rule, it is now universally admitted that the horse is the animal best suited for farm-work of all kinds; and accordingly oxen are now rarely seen in a team, or at plough, excepting it be in Devonshire and some other parts of the West of England.

The choice of the horses for a farm, is a matter of great importance. The heavy cart-horse may be capable of greater exertion at the moment, for a dead pull; but in a long day, the lighter active horse will get through work which would kill the heavier animal. Horses about 15 hands high, with short legs, and broad chests, such as the Suffolk Punches, or the active Scotch horses, are by far the best and most economical for farm-work. Where the horses are heavy and sluggish, the men become sluggish likewise, and the work is in consequence slowly and badly performed. Moderate-sized, active horses, are therefore to be preferred to the larger, slower kind, except for particular work, where great strength and weight are required. The general business of the farm, such as ploughing, harrowing, and carting, require activity as well as strength; and a stout kind of horse of the above description, will answer for the collar, as well as carry its master to market and fairs.

It is very important that the farmer should ascertain, as accurately as possible, the number of horses actually necessary for the proper cultivation of his farm; and to enable him to do this, all the circumstances connected with it must be taken into consideration—such as the nature of the soil, the quantity of arable and of pasture land, whether lying compact or straggling, the state of the roads, and the distance from market. Nothing in this respect can be laid down as applicable to all cases, but as a general rule it may be said, that a farm of good light loam will require a horse for every 25 acres, with one additional for every 200 acres; that is, 9 horses for 200 acres, and so on in proportion. The larger the fields, the fewer horses are required to do the work, much time being lost in turning where the fields are small.

The field-work should be so arranged, as to give the horses at least two hours' rest in the course of the day, when they should be carefully fed and rubbed down. In summer, if the weather is very warm, the working hours may be from 5 in the morning till 10, and then from 2 till 7—thus resting four hours at the hottest part of the day; otherwise, from 6 till 11, and from 1 till 6 —resting two hours. In winter, the time should be from 7 till 4, resting an hour between 12 and 1. The better your horses are used and cared for, the better will they do your work, and the more profitable servants will they be found.

Working horses should scarcely ever be allowed to pasture in the field; for they fatigue themselves by roaming in search of food, are incommoded by cold, rain, the sun, or flies, and the manure is lost or wasted. Young idle horses and colts may, however, run out at all seasons, for the horse is a hardy animal: but the working horse requires rest during the time which, if turned out into the field, he would be seeking his food; and a sufficiency of good provender is what, as a good servant, he is entitled to have provided for him, at the end of his day's work.

Considerable saving may be effected by judicious management in the food of farm horses, for although there is nothing more congenial to the stomach of a horse than good hay and oats, with bruised beans and chaff, there are yet cheaper fodders, especially in summer, on which a horse will thrive and do well. Tares, clover, lucerne, and sainfoin, will keep a horse in good working condition; and carrots and Swedish turnips, in moderate quantities, will be of great use. A supply of these plants and roots will always be provided by the prudent farmer, whose horses will then cost him much less than if fed with hay and oats the year round.

In purchasing a horse, there are a few marks which ought always to be attended to, and it will be better to point out these, than to give any lengthy instructions upon the several points of excellence. If a horse has a small head, and short pricked ears shaped like those of a fox, with short legs, and round barrel-shaped ribs close up to the hip-bone, depend upon it you cannot go far wrong in purchasing him. There is no good horse without one of these points, and the best horses have them all.

The mare is often preferable to the gelding for the farmer, especially for the small farmer. The mare generally costs less, and it seems now to be admitted, that she will do more work and last longer than the gelding. The mare need not be idle whilst in foal; and if not compelled to carry heavy weights, she may with care be used till almost the hour of foaling; but she must have a few weeks' rest afterwards, and lighter work, until the foal is weaned.

If a stout useful cart-mare is crossed with a compact well-knit half-bred horse, the farmer may be pretty certain of having a useful kind of foal. The colt should be well fed and taken care of, or it will not thrive. Do not break it in till it is three years old, and then set him to light work with the plough and the harrow, gradually bringing him to heavier work as his strength increases with his years. Until after five, however, he should be worked with care, and not be over pressed, for a horse cannot be considered to have attained his full powers until he is six, and hardly then.

Be very particular in the selection of a stallion, and pay for a good one, rather than have your mares crossed by a bad weedy animal for nothing. He should have a small head, short ears, prominent eyes, short legs, a wide chest, and high forehand. His arms and thighs must be broad and muscular, his back straight and broad, and his body long, with little space in the flanks between the ribs and hip-bone. The maladies and defects to which the horse is subject, as well as its excellencies, are almost always hereditary. Contracted feet, the curb, spavin, thick wind, blindness, descend from sire or dam; and hence the importance of being careful in the selection of each.

THE SHEEP.

The average number of sheep in the British Islands has been estimated at 40,000,000, and if we reckon them to be worth only 1*l*. per head, it will give 40,000,000*l*. as their total value in money, which is, however, considerably under the mark. It has likewise been estimated that the value of the wool obtained from the sheep every year is equal to 20,000,000*l*., and that 10,000,000 of sheep are slaughtered and brought to market annually—this gives 30,000,000*l*. as the value per annum of sheep to the country; and if we consider further the number of persons who obtain a livelihood by attending to the sheep, and by the manufacture of the wool in all its stages, we shall be sensible of the vast importance of our sheep in a national point of view, and how necessary it is to attend to this branch of British industry.

Sheep are generally of a wandering nature, especially the hardy sorts, and thrive best on extensive ranges; but they will do well and may be kept with advantage on a moderate-sized farm, the number of course being regulated by the extent of land. Sheep will likewise thrive if fed in the house. Indeed stall-fed sheep fatten much faster than when they are at large; the exercise they then take, and their exposure to the weather, serving to retard their fattening. Warmth and rest always promote the fattening of every description of animal, and these are secured by house and stall feeding.

There are many different breeds of sheep, but they are usually divided into *the long-wooled*, and *the short-wooled kinds:* the first includes the Leicester and Coteswold breeds, and the latter includes the Southdown, the Cheviot, and the Black-faced or Forest or Mountain Sheep.

The Leicesters, are large fine animals, but they require a good pasture, and are not so highly prized by the butcher as the Southdowns, which are not so large, and make exceedingly fine meat. The Leicester is nevertheless a very valuable breed of sheep, and they thrive well in our rich lowland pastures.

The Southdowns, as their name imports, are generally found on the wide ranges of downs which extend throughout the southern counties of England, and are perhaps, on the whole, the most valuable of all our breeds: they are, moreover, in all probability, one of the oldest. A cross of the Southdown and Leicester will give an increase of weight, without material injury to the quality of the meat; but the cross must not be repeated, or the purity of the breed will be lost.

The Coteswold breed, is somewhat larger than the Southdown, and is a valuable animal, especially for its wool, which is very long and fine.

The Cheviot, is a highly improved Scotch breed. It is very hardy, and is well adapted for hilly, mountainous, and cold districts, in which it does better than the Southdown, and is better both in fleece and carcass than the mountain sheep.

The Black-faced Mountain Sheep, are esteemed for their great hardiness, and the quality of their meat; but they are small, and extremely wild, and are only calculated for the hilly districts of Wales and the West of England.

The Foresters, are a variety of this latter kind, which was probably the original sheep of the country; but they are, like the Welsh breed, unsuited for the general purposes of the farmer, and cannot be kept with advantage unless it be on wild mountain-ranges, and even there the Cheviot will generally be found to answer better.

These are the principal kinds of sheep which are reared in England. Each has its merits, and each its advocates; but the preference of any particular breed ought perhaps generally to depend upon local circumstances, one breed being fitted by habits and constitution for one situation, and another for another; and on this point the farmer must be guided by his own judgment and experience.

The more highly sheep are bred, the more valuable they become to the farmer, and the more social with one another. The Southdown (which are considered our highest and most valuable breed) feed closer together, are more easily tamed, and admit of closer stocking than any others. The more highly sheep are bred, however, the more liable are they to degenerate, if neglected, and the more care and attention will be required to keep their good qualities unimpaired. This is sometimes attempted by occasional crossing with other breeds; but if the breed be pure, crossing is dangerous, and can rarely be recommended. If attempted, the cross should be with the Leicester, which is the best, and indeed almost the only one with which a valuable cross can be made. The cross will sometimes give an improvement in form, with a larger quantity of wool, and an animal that will fatten more readily; but this result is by no means certain.

The most certain way of improving and keeping up a good breed of sheep, is by constantly selecting the very best of the flock for breeders, and discarding the animals of inferior kind or defective form. This may be done gradually, without interfering with the general fertility of the flock; and if steadily pursued, it will rarely fail in effecting its object. The selection should be judiciously made with reference to breed and situation, and the selected ewes and rams should be kept apart from the rest of the flock, and have a distinctive mark that they may always be known. Their lambs also should be kept separate, and be marked in like manner.

In addition to the careful selection of the breeders of your own flock, some other change is occasionally necessary, or the flock will be injured by a long-continued " breeding in-and-in." The ewes will lose their fecundity and produce fewer lambs, and the quality of your sheep will become deteriorated. To prevent this, the farmer should exchange his rams every second or third year, with some other farmer whose flock is of the same breed, and as nearly equal in quality as possible. This change will effectually prevent the evil that would arise from continuing to "breed in-and-in," without any break. The more distant the farms from which the rams are so exchanged the better.

The usual time for putting the rams to the ewes, is from the middle of October to the middle of November, and as the period of gestation is five months, or 152 days, the yeaning will take place between the middle of March and the middle of April. The ewes and rams will of course have been kept apart, and, previous to the pairing, the ewes should be carefully examined, and those which show any signs of disease, such as dullness and deadening of the eye, darkening of the teeth, and tainted breath, should be rejected and sent to be fattened. When the objectionable animals are thus weeded out, the ewes should be placed in a good pasture previous to the rams being admitted.

The breeding ewes should be gently treated, and must never be hurried, nor be followed by dogs in removing them from one field to another. As the lambing-time approaches, a dry convenient sheltered spot should be selected for the lambing-ground, and the ewes should be gently removed thither a few days previously. During parturition they will require particular attention, and should never be left without the means of assistance when required. The attendance necessary on such occasions, is generally given by an experienced shepherd, or some other person conversant with the nature and management of sheep.

It is not desirable to employ dogs for driving and collecting your sheep, for the barking of a dog always alarms sheep, which are so timid that even when folded on turnips, the presence of a dog at the heels of the shepherd will often prevent their feeding. In large ranges of pasture it may be necessary to use dogs, but this should never be done if it can be avoided, as, notwithstanding the utmost care on the part of the shepherd, it will certainly tend to impede the fattening of the flock.

THE PIG.

The pig is found in every part of the world, from the Equator to the Pole. It lives and thrives on every kind of food, and no animal converts its food so soon into fat. In a wild state, the food of the hog is chiefly grass, roots, acorns, beech-mast, and wild fruit. In its domestic state, it is chiefly fed upon barley-meal, peas, potatoes, turnips, and the refuse of the kitchen, dairy, and garden.

There are various breeds of pigs reared in this country, and crosses between the one and the other are constantly taking place, according to the fancy or the judgment of the breeder.

The China pig, as its name imports, is of Chinese origin. It is short in the head, with pricked-up ears, full wide cheeks, high in the chine, and very short legs. This breed is very prolific. The pigs easily fatten, and although they do not grow to a great size, they will pay well for their food, and may be killed for bacon at a twelvemonth old.

The Neapolitan pig, is black, without any hair, and very plump, with pricked ears. It fattens as readily as the China breed, but is not so prolific, and is more tender. Crosses of the China and Neapolitan kinds with our hardier English breeds, have greatly improved the latter, by increasing their prolificness, and their aptitude to fatten.

The Suffolk breed, is generally white, with pointed ears, broad chest and loins, and short compact form, much resembling the China sort. They make fine bacon-pigs, weighing from 12 to 15 score at twelve or fifteen months old.

The Essex pig, is for the most part black, or black and white, with little hair, and in form and character bears a strong resemblance to the Neapolitan breed. It fattens very readily, and at an early age.

The Berkshire breed, is a very well-shaped animal, having small pricked ears, broad chine and loins, good hams, and short legs. This is a very valuable breed, and second to none for the farmer.

These are the breeds principally reared in this country, but there are some large breeds of pigs still found in some districts, and prized on account of their great size; but they do not so soon come to maturity, and will not be found so profitable as the smaller sorts, which are more prolific, and fatten more readily, and at an earlier age.

The best-formed pigs of the litter should always be selected to breed from. This will serve to improve the breed, without crossing; but where the sow and the boar are too nearly related, the fecundity diminishes, and hence frequent crossing with other boars and other breeds is found to be necessary. To increase fecundity, no cross is so effectual as that with the China breed.

In order to obtain the greatest profit from the keeping of pigs, a regular system must be pursued, both in the breeding and feeding. There must be proper hog-sties for the pigs of different ages, and the breeding sows must be kept separate. Coppers must be provided for boiling and steaming their food, and tanks in which it may then be deposited and mixed; and the greatest cleanliness should be observed in everything connected with their feeding and management. The pig is naturally cleanly in his habits, and although he is sometimes seen wallowing in mud, it is not from the love of dirt that he does this, but to allay the heat and itching of his skin in warm weather. If allowed a sufficiency of clean straw and water, the pig will never be dirty; and nothing pleases him more, and makes him thrive so quick, as being washed and curried regularly.

The sow goes with young four months, and when near farrowing she should be put into a sty by herself. The pigs should not be taken too young from the sow, as they are then apt to get sickly; but if allowed to get strong before weaning, they are seldom liable to disease afterwards. They ought never to be weaned before they are six or eight weeks old, and at the time of farrowing the sty should not have much straw, lest the young ones be trodden and overlaid; and the sow must be frequently attended to, as some are apt to destroy their young. Eight or ten will be enough to rear in one litter.

The sow having a litter of pigs to support, should be well fed with beans, barley-meal, and milk or whey. Grains are also good if they can be got. In summer she may be allowed to go out occasionally for an hour or two, into a grazing meadow, if near at hand; but the young pigs must not be allowed to accompany her until they are a fortnight or three weeks old. A sow will live many years, and bring numerous litters; and in general an old sow makes a better nurse than a young one, and she ought therefore to be kept as long as she will breed. Young sows may have a litter at ten or twelve months old, and may then be spayed, and fed for bacon. This should likewise be done whenever a sow does not breed well, or eats her pigs.

In the management of pigs, a comfortable warm sty is an object of the first importance. It need not be large, but it should have an opening to the south if possible. If pigs are kept clean, dry, and warm, one-half the food will suffice, which would be requisite in a cold, wet, or dirty situation; and depend upon it, if you attend to the comfort of your pigs, they will return your kindness tenfold, in the shape of bacon, ham, and lard. The flooring of the sty should be raised and flagged, or laid with brick or tile, that it may, in warm weather, be washed clean, as the pigs will not then require bedding.

Almost anything will serve as food for your pigs—potato peelings, cut clover, boiled turnips, cabbages and garden-stuff, small corn, acorns, beech-mast, and the scrapings and washings of your pots and dishes: but whatever is given to them, let it be first boiled or steamed, and then be laid by for a day or two before using, as it is well known that a pig will fatten sooner on stalish food, than when it is quite fresh. One-half the quantity of potatoes will, if boiled, keep your pigs, which would be required if they were used raw; and the same rule applies to all other vegetables.

The pigs should never be allowed to roam about in search of food, for if not ringed in the nose, they will turn up and destroy the grass lands; and if ringed, they will tire and fret themselves in vain exertions to dig. Every day a pig is loose, is a certain loss in flesh and fat; and he should never quit his comfortable sty from the time that he is littered till he is fit for use, unless it be when very young, when he may be permitted to accompany the sow for a short time, as is above recommended.

POULTRY.

The management of poultry is commonly understood by every farmer's wife, and therefore little need be said here respecting it. But when we consider the vast quantity of fowls and poultry of all kinds which is annually consumed,* and the immense produce of eggs which are daily brought to market, the subject is obviously one of considerable importance; and it is quite certain that the rearing of poultry will not be overlooked by the prudent farmer, nor their management be unattended to by the thrifty farmer's wife.

The number of geese, ducks, fowls, and turkeys kept in the farm-yard, should be proportioned to the quantity of grain likely to be scattered, and which would be lost were not these animals kept to gather it up and prevent the waste. It is this circumstance, which allows poultry and eggs to be sold at such low prices; for were all their food purchased, or taken at its actual value, their cost to the farmer would be greatly increased, and so by consequence would their price in the market to the consumer.

Fowls.—The several sorts of fowls which are kept in this country, are generally much mixed, and often deteriorated, but the common fowl is perhaps nearly as valuable as any. The grey Dorking, and the black Spanish sorts, are however to be preferred to all others, when they can be gotten pure. Both these kinds are good layers, give large eggs, readily fatten, do not stray far, and command a high price in the market.

All fowls having white legs are to be preferred; but the game sorts, with green or yellow legs, are to be avoided as being too delicate; whilst those with black legs are not so marketable, their flesh being often dark coloured. Long-legged fowls are not worth keeping.

Fowls fatten best when confined, and they also then require less food; but they must be kept warm. If allowed to range about, they rarely get fat, however abundantly they may be fed.

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* The value of fowls consumed in London alone, it is estimated, amounts to upwards of 100,000*l.* annually.

Eggs.—The nests should be placed in the hen-house, and as far removed from the roosting-place as possible, that the hens may not be disturbed either in laying or hatching. Baskets are better than boxes. A little straw only is necessary, and let it be always kept fresh and clean; for if this be not attended to, the eggs will become tainted in a few hours after they are laid.

Nothing contributes more than warmth to the hen's laying plentifully, and a good short-legged hen, if well fed and kept warm and undisturbed, will produce 150 eggs, besides bringing up a brood of chickens, every year. Keeping too many half-starved fowls is bad economy, three or four well-fed ones being worth more than double the number otherwise treated; and if six hens be kept to one cock, they will be more prolific than when the proportion of females is greater.

Warmth being of the greatest importance, the hen-house should have a southern aspect, and be free from damp; and if possible it should be so built, that the warmth of a flue or chimney may have access to it.

To preserve eggs fresh and good, they should, immediately they are laid, be put into dishes of lime-water; or else be rubbed over with a little lard, mutton-fat, or butter, and placed upon their ends. If laid on their side, the yolk will adhere to the shell, which spoils them when kept long. Those rubbed with fat, should not be above a fortnight without turning and wiping them over: but lime-water is the least expensive, least troublesome, and best mode of preservation; and the eggs thus preserved will keep good for six months, if turned occasionally.

The Duck.—If there is a pool or stream in the vicinity, ducks should certainly be kept. They are great layers in spring, and rear their young with very little assistance: but the ducklings must not be allowed to go much into the water till they are about a week old, as they are apt to die from cold. Except attention for the first few days, they require little feeding or care afterwards; and if a pool, meadow, or common be near, they will shift for themselves, worms and insects being their favourite food. Six ducks would be of more use to a poor man's family in spring, than the best goat, and they would be comparatively of no expense, nor give one-half the trouble. One drake is enough for six ducks.

Turkeys, are valuable birds, but they are tender and require care in rearing, and are great feeders. If you set the eggs under a common hen, and keep her confined, allowing the young birds to run about, and vary their food by feeding them upon chopped nettles, buttermilk, curd, and oatmeal, they will thrive well; but they must be protected from wet as much as possible, as indeed must all birds when very young. To get curds at any time, you have only to boil a small piece of alum in the quantity of milk desired, and it will soon turn to curd and be ready for use.

Geese, require little care, but they are very mischievous in the corn-yard, by pulling out corn from the stacks, &c. Where there is water, or a common for them to feed on, they may be profitably reared and with very little trouble, and the feathers are always valuable.

When first hatched, do not let them wander far, but the old goose must not be shut up. A yard or empty barn is the best place for the goslings for the first week, letting them out two or three hours each day to feed on grass. When fattening for the market, put them on your stubble, and at home feed them on raw turnips chopped, and water, with very little corn.

It has been often remarked that cattle are rarely unhealthy where any considerable number of geese are kept, for the geese will eat and thrive upon certain weeds and grasses which are more or less unwholesome for cattle, and which are mingled with the herbage in most pastures. Most farmers are aware of this, and a sickly cow or bullock is not unfrequently turned into a field where geese have been allowed to range, with the view of its deriving benefit from the *change. The* grass on commons, on which geese are *kept, is always* fine and sweet.

It may be observed, in conclusion, under this head, that poultry are by no means undeserving of attention. A considerable sum may, by good management, be turned over every year by a careful farmer's wife, with little labour, and at a small outlay. The birds, the eggs, and the feathers will all find purchasers; and the produce will serve to procure many little comforts and conveniences for the family, which might not else be attainable.

THE DAIRY.

The Dairy, is an important appendage to every farm. It should have a northern aspect, and should always be kept cool and airy, and scrupulously clean. All the dairy utensils should be scalded, scrubbed, rinsed, and dried every time they are used. If they are made of wood, oak or lime is the best material; and if of metal, zinc is to be preferred to lead.

Glazed pottery is not considered desirable for dairy purposes; the acid of the milk acts upon the glazing (which is generally an oxide of lead), and converts it into an active, although in this case extremely diluted poison. Wooden vessels are perhaps, on the whole, preferable to any other for dairy purposes; but they are liable to become tainted with the acidity of the milk, in which case they can only be thoroughly cleansed by boiling; and when this fails, a little soda added to the boiling water will effectually destroy the acid. The vessels must afterwards be immersed for two or three days in water, which should be changed occasionally.

Milk.—Treat your cows with kindness, and avoid harshness, even of language, particularly at milking time. Always draw the teats after the calf has sucked, so that not a drop of milk may remain. No practice can be worse than leaving milk in the udder, for the more you leave, the less each time will you have; and the last milk is always richer than what is first drawn, the richness continuing to increase to the last drop.

The general practice in this country, is to milk the cows twice a day; but when they are fed in the house, and liberally supplied with succulent and nutritious food, it is necessary to milk them three times a day, viz., very early in the morning, at noon, and at night; for if only milked twice a day, they will yield a much smaller quantity of milk in the twenty-four hours, than if milked three times. A cow in these circumstances will give nearly as much milk at each time of milking, if milked three times, as if she were milked only twice. In Flanders and Switzerland, where the cows are house-fed, they are always milked thrice a day.

The cows should be milked close to the dairy, so that the milk may be set by without getting cooled, or much shaken. The milk must be strained through a hair sieve, and the greatest neatness and cleanliness should distinguish all the dairy operations. In case of the milk acquiring a taste from turnips, cabbages, or other food, a small quantity of saltpetre will generally destroy the taint, and render it tasteless.

Milking should always be performed very gently, in order to prevent its being painful to the animal. Instances occur in which cows will not let their milk down to a harsh, hasty, cross-grained milker, but will yield it freely to a mild, good-tempered dairy-maid. When cows are skittish, which will sometimes be the case, they should be treated with soothing gentleness, and never with harshness or severity, which only makes them worse. When the udder is hard and painful, it should be tenderly fomented with warm water, and rubbed very gently, by which means the pain will be relieved, and the cow will then yield her milk freely, and without restraint.

That part of the milk which comes first is always thinner, and not so good for butter, as that which is afterwards obtained. The cream rising first to the surface, is richer in quality and greater in quantity than that which rises afterwards, and it continues declining in quality and in quantity so long as any rises.

Thick milk throws up a smaller proportion of the cream which it contains than milk that is thinner, but the cream is of a richer quality; and if water be added to thick milk, it will afford a greater quantity of cream, and consequently more butter, than it would have done if no water had been added. Where butter-making is an object, this should be attended to.

Milk which is carried a considerable distance after milking, so as to be shaken and cooled before it is put into the milk-pan, never throws up so much cream as when put warm into the pans directly it is milked. Hence it follows, that the cows should be milked as near the dairy as possible.

Butter.—In the large dairies, churning is now usually performed by machinery, worked by the steam-engine, or by horse or water power, or else by attaching the churn to the thrashing-machine. The most general mode, however, is by the hand-churn, of which there is a variety of kinds and sizes, the plunge and the barrel churn being the most common.

Some persons suppose, if the cream for churning is not taken off whilst the milk is sweet, that the butter cannot be good; but this is a wrong notion. Milk should stand as long as it is sound, before it is skimmed, to afford the most butter, and of the best kind.

In some parts of England, and very generally in Ireland and Scotland, it is the practice not to separate the cream from the milk, but to churn both together; by which means a large quantity of buttermilk is obtained, which is much used by the people, although in this way the milk is never churned until it has become sour. Whether the cream be separated from the milk, or that they are both mixed together, the process of churning is the same. In the latter case, however, more time is required, as much as two or three hours being necessary for obtaining the butter; whilst, if the cream only is put into the churn, half an hour is generally sufficient.

When cheese is made, the milk must be skimmed whilst it is sweet; but with butter this is not necessary. Much depends on the weather. In cold weather, milk may stand three, four, five, or even six days, before it is skimmed; but in hot, close, or thundery weather, perhaps not above twenty-four hours. The cream will keep best on the milk, as long as the milk is sound; and the sooner cream is churned into butter, after it is taken off the milk, the better.

In summer the churn should be made as cold as possible, when the cream is put into it; and in cold weather the contrary, by putting hot water into the churn to make it warm. Place the churn in a tub of cold water, whilst working it in summer; and in winter, or cold weather, you may churn in a warm room, but not near the fire.

Butter should be put into fresh spring-water immediately after churning, that it may become firm; and at the end of the third or fourth washing, throw some salt into the water to raise the colour of the butter, and purge away any milk that may remain in it, and which, if left, would give it an unpleasant taste. It is then fit for market; but if intended to be cured, let it be put into the cask immediately, and properly salted.

Butter is best cured by a mixture of one part raw sugar, one part nitre, and two parts of the best common salt, well mixed together, and reduced to a fine powder, one ounce of which is enough for a pound of butter. When packed for sale, the butter cannot be pressed too firmly into the cask, nor too carefully covered up to exclude the air.

It is very wrong to keep a making of butter unsalted till the next churning, for the purpose of mixing the two makings together; for this injures the flavour, and renders the whole mass too soft ever afterwards to get firm.

Butter of the very best quality can be made most advantageously in dairies where cheese is also made, because the inferior milk and cream may then be turned into cheese.

It is a complaint against the use of turnips as food for cows, that they give a bad taste to the butter; but this may in a great measure be obviated by care and attention. Turnip-fed milk will get rancid sooner than grass-fed milk, and this tendency is increased by placing the churn near the fire, as is sometimes done in winter. The churn itself should always be kept cool, and the churning should be done in a cool place, although as much boiling water as is necessary may be added to the milk. It is very important to churn often, at least twice a week; but when this cannot be done, add one-eighth part of boiling water to the milk as it comes from the cow, and cover it over with a double cloth, which will imbibe the steam, and carry off with it the peculiar flavour which the turnip is apt to communicate.

Cheese.—In cheese-making, the first thing requiring attention is the rennet, which is used to convert the milk into curd. This is the stomach or maw of a young calf, which is sometimes prepared with, and sometimes without, the curd found in it; but in either case, it is the gastric juice of the stomach, which, when applied to milk, converts it into curd.

The rennet is prepared by first salting the stomach, and then hanging it up to dry for three or six months. Some people say it should be kept twelve months. When wanted for use, place it in a jar, and pour a couple of quarts of soft warm water on it, and allow it to stand in the jar two or three days; then strain it off, and keep it in a bottle, corked tight. A tablespoonful will be sufficient to coagulate thirty gallons of milk. This mode of preparing the rennet will be found as good as any, but there are various methods in use in different parts of the country, any of which will probably answer as well. The great object is to apply the gastric juice contained in the rennet, in such a way as that it shall communicate no unpleasant taste to the curd.

The following will be found a good receipt for cheese-making:—

A sufficient quantity of milk being collected to make a cheese of the size required, let it, when skimmed, be warmed over the fire to blood-heat, and formed into curd by means of the rennet. Cream may then be added, according to the richness of the cheese desired; and the addition of a small quantity of buttermilk makes the cheese speedily become blue. Work the curd slightly at first, by scoring it with a knife, and afterwards break it more minutely, but gently, so as to separate the whey from it completely—after which, add half an ounce of salt to every pound of curd, and put it under the press.

All these operations ought to be carried on with despatch, but at the same time without hurry, or precipitation. When the cheese has been two hours in the press, let it be taken out, turned, and replaced; and repeat this and change the cloth three or four times a day, for two or three days; after which it may stand for a week, turning it frequently. When it has become tolerably hard, it may be removed to the cheese-room, and turned till it is perfectly dry.

The cheese-room should be cool, and have a moderate current of air passing through it, which is always advantageous to the cheese.

BEES.

Bees, are to be valued, not only on account of their affording in their honey a most wholesome description of food, and in their wax a valuable article of household economy; but likewise in the useful lesson they teach us by their industrious habits, the contemplation of which will lead us to reflect more frequently on the wisdom and goodness of the Almighty, whose providence protects even the humblest insect, and guides it in the pursuit of objects suited to its condition and its wants.

Few things are more indicative of an industrious and thriving family, than a row of bee-hives in the corner of a neatly kept garden; and although some persons may suppose that the management of bees requires much skill and time, this is far from being the case. It may be thought by some persons that our climate is too cold and wet for bees; and they may not, perhaps, thrive quite so well here as in warmer climates; but still they will thrive here, and that so well, that you may always reckon upon having as much honey as will be useful in your family, and be a luxury to your children, if you do not get enough to sell; and this at little more expense than purchasing the first swarm, and the cost of the hives.

The following brief rules for the management of bees, will, if attended to, be all that is requisite to ensure their thriving:—

Weigh the hive before and after a swarm is placed in it, and keep a note of its weight: you will then be able to judge of the quantity of honey it contains in autumn.

Your hives must be sheltered by a wall, a hedge, or belt of trees, in order that the bees when coming home tired and heavily laden, may get to the door of the hive with ease. This they cannot do if there are gusts of wind sweeping round it, in which case numbers of them will fall to the ground about the hive, from which, perhaps, they will not be able to rise before the chill and damp of the evening come on and destroy them.

There must be water near your hives, as the working bees drink a great deal in spring; and they are very fond of walking along straws which float in the water, and sipping as much as they want.

The door of the hive should look toward the forenoon sun, and the hive should not be raised above eighteen inches from the ground.

We will now suppose that your bees have laid up their winter store, and that you wish to share it with them; we say *share* it, because we do not suppose you are so foolish as to kill your bees. To say nothing of the unnecessary cruelty of so doing, merely ask yourself if a man would be wise, to kill his cow for the purpose of getting her milk? The more bees you have the more honey—that is certain. People who get their honey by killing their bees, would to a certainty have much more if they kept them alive.

About the latter end of September, the blooming season is over, and few flowers remain for the bees to get honey from. This is the best time to ascertain what honey they can spare. Therefore weigh every hive, and deduct from it the weight of the hive and the bees, as ascertained when the swarm entered it at first, as above directed.

To live through the winter, a hive must have at least sixteen pounds of honey; and if you wish it to swarm early, it ought to have twenty pounds: but do not grudge them twenty-five or even thirty pounds; they will thrive so much the better. A hive of a year old, or more, should be allowed thirty or thirty-five pounds; while for one of the present year, sixteen or twenty pounds will be sufficient, old combs being heavier than the new. A hive with a sufficient quantity of honey, as above, will thrive better than one which has the combs filled to the board; because the bees in the latter case will not have empty cells enough in spring for their eggs, so that in all probability they will not be sufficiently strong to swarm that season.

There will always be some hives, which will not have honey enough to last till the next spring. If they have from ten to fourteen pounds, add as much more as will support them; if less than that, take from them what they have, and join the bees to another hive that has honey enough.

You are, therefore, to take the honey from hives that have much above twenty pounds, or less than ten pounds: but it is not advisable to take the honey from a hive that has just enough, even though you save the bees, because you thereby diminish your stock of hives for next year; and there is no fear of your having too many hives.

We will suppose, then, that you have three hives, 1, 2, and 3. No. 1 is the old one of last year, Nos. 2 and 3 are this year's swarms; No. 1, from having had the swarm No. 3 come off late, has collected little honey, say nine pounds; and No. 3 has only ten pounds, not having had time to gather more; and No. 2 has forty-seven pounds. If you leave them all untouched, Nos. 1 and 3 may possibly exist till spring, but will certainly die then; or even if they do not die, they will not collect honey enough to support themselves through the next winter, nor give you swarms.

In this case, if you are desirous to keep all three, to increase your stock, take No. 2, and cut away carefully about twenty pounds of its honey, as described hereafter, and distribute it to Nos. 1 and 3. But as you may be desirous to have a little honey yourself, after waiting so long for it, take the honey out of No. 2 entirely, and give Nos. 1 and 3 as much as they require, and the remainder will be your own. Then join the bees of No. 2 to No. 3, in the manner stated below, which will thus become strong for next season. The same method is to be pursued, whatever number of hives you may have.

The only secret to make your bees thrive, is to let them have enough of food in autumn. It will not do to give it to them in spring; and incredible as it may appear, the same quantity of honey which will support a single swarm, will suffice for two, or even for three joined together in the same hive.

When you determine on taking away the honey from a hive, either for your own use, or for distributing to other hives, proceed as follows:—The first fine calm morning after the honey season is over, go to your hive, provided with a tobacco-pipe in your mouth, a large dish for the honey in one hand, and a long knife with the point bent, and a goose or turkey feather in your other. Blow two or three full puffs of smoke in at the door, then turn the hive upside down on the ground, so as to stand steadily; and immediately give the bees (who will collect on the edge of the combs to see what is going on), a little more smoke. This will stupify them so completely, that not above one or two will be able to fly out, and they will be so sick that they will not dream of stinging you. Begin at one side of the hive, and cut out a comb, having first sent down a puff of smoke to make the bees go away to the middle and the other side. Proceed thus (sweeping the bees off every comb back into the hive with the feather), till you come to the centre comb, laying each comb, as cut out, into the dish covered with a cloth; then begin at the other side, and do the same; and last of all cut out the centre comb. The only nicety consists in blowing away the bees, to prevent any of them being crushed. If the operation be neatly done, not above a dozen bees will be killed. Take the hive now, and replace it on its stand, as before.

The next thing to be done is to join the bees from which the honey has been so taken, to another hive in which you wish them to be accommodated; and the manner of doing this is as follows:—

In the evening, if you look into the hive which has been deprived of its honey, you will find all the bees hanging in the centre, just like a new swarm. Bring the hive near the one to which they are to be joined. Get about eight table-spoonfuls of run honey, or syrup, so thin as to pour easily, and have it in a jug beside the hive which is to receive the strangers. Blow a few whiffs of tobacco smoke in at the door of this hive, then turn it up and give them an additional puff or two, and pour the honey or syrup from the jug all over the bees between the combs, so that they may be quite smeared over. Then spread a clean linen cloth on the ground in front of the hive, with one edge of it placed on the floor of the hive, and secured there by two stones to prevent its falling, and which will also serve to keep the hive a little raised from its floor on that side. Now replace the hive, so that the edge of the cloth may be under it, while the two stones keep it raised about an inch. Next take the hive containing the bees, hold it steadily over the cloth, and by one sudden blow knock out all the bees upon the cloth in a lump. They will immediately begin to climb up and enter the new hive; and though part may remain out during the evening, every one will have entered before morning, when you may take away the cloth and the stones, and the two swarms will ever after live together in peace. If they were to be united without previously smearing one of them with honey, or syrup, the chance is that half of both hives would be killed by fighting.

The best method of furnishing a light hive in autumn, with sufficient honey to keep them till next season, is as follows:—

Take some pieces of honeycomb in a dish, and a board rather larger than the diameter of the hive; blow a few whiffs of tobacco smoke in at the door of the light hive, turn it up, give them a little more smoke, and proceed to cut out as much of the empty comb, as you have pieces of full comb to fill up. When you have done this, and inserted as much honey as they require, place the board on the bottom of the hive, and turn it carefully over, replacing it on its stool. In two or three days the bees will have joined all the pieces of loose comb to their own combs, and you may then take away the board. In spring, when they have emptied the cells, turn up the hive and take away the empty comb, and the bees will soon replace the vacant spaces by new comb. If you have no comb to give them, nor honey, make as much syrup of sugar and water, well boiled, as they would require of honey; or treacle and water may be used, of the consistence of honey; and insert this food, in long wooden troughs, at the door of the hive. But always remember, if you wish your bees to thrive, they must be supplied with food in autumn, not in winter or spring.

The foregoing directions are founded on experience, and may be followed with confidence; but a new method of obtaining the surplus honey, without disturbing the bees, has of late been recommended, and it seems to possess some advantage over the old method, as above described, and to be worthy of a trial; after which it may be continued or abandoned, according as the result is found satisfactory or otherwise.

In March, before the bees begin to work, place a tub, such as is used for butter, or other similar vessel, under the hive, and over this put a board about half an inch thick, having two holes in it, each an inch in diameter; on this board the hive is to be set. When the bees have filled or nearly filled the hive in the course of the summer, they will descend through the holes in the bottom-board into the tub or vessel below, and there commence making comb and depositing honey; which may easily be removed at the end of the season without disturbing the hive. This is a very simple process, and the quantity of honey obtained in this way, is said to be often very considerable, and that which is left in the hive is always sufficient to carry the bees through the winter, as they will never commence working in the vessel below, until they have accumulated a sufficient store for their own use in the hive above.

Late swarms, which have not had sufficient time to collect their winter provender, must be fed as usual.

In winter, say from the 1st of November to the 1st of March, your hives should be placed in a northern exposure; or at any rate the sun should not be allowed to shine much upon them, as it entices the bees out, when they get benumbed with the cold, and perish. They would also eat twice as much of their winter store, as when kept in the shade.

Your hives may be either of straw or wood. Bees thrive equally well in either; but the wood lasts longer, and the honey is more easily got out of them, than from straw hives, and they are therefore, on the whole, to be preferred. The wood should be 1½ inch thick, to protect the bees from changes of temperature.

You ought to keep hives of different sizes, and the small or late swarms should be put into small hives, while early swarms will succeed best in large hives.

After hiving a young swarm, if the weather for some days be wet, they must be regularly fed with syrup, or treacle and water, or there will be great danger of their dying.

Never put sticks in your hives to support the combs. They are unnecessary, and prevent your cutting out the combs, without much trouble, when that operation is required.

SUMMARY OF WORK FOR EACH MONTH.

The farmer who wishes to thrive, must so order and arrange his work, as that everything shall be done at its proper time, one operation never interfering with another: for nothing is more important than the right management of time, in carrying on all the operations upon a farm. When everything is done at the proper season, haste and waste will be avoided, the work will be better performed, and the chances of success will be proportionally increased. A general summary of the work to be done in each month throughout the year, may therefore not be without its use, as a conclusion to the foregoing directions.

October may be considered as the commencement of the agricultural year, the previous crops being secured, and preparations for those of the coming year being now necessary. As soon as the ground is cleared, commence ploughing the stubble land; and your seed-wheat must be got into the ground as early as possible this month. Cattle should be taken up from grass, and sheltered in the straw-yard. Rams may be turned to the ewes; and the cattle which are to be fattened, must now have a full supply of turnips.

November.—This is a busy month on arable lands. Wheat may still be sown as late as the middle of the month; and preparations must continue to be made for the crops of the next season. The plough must be kept constantly going, when the weather will permit. All soils are the better for being exposed to the winter's frost, and nothing should prevent the industrious farmer from getting on with this part of his work.

The pastures will now have failed, and the cattle, if turned into the fields, will only poach the land with their feet. They must therefore be fed at home on straw, hay, and turnips, or other green food; and always remember that to take good care of his cattle during the winter, is the farmer's best policy. The sheep may be allowed to remain on the high grounds till the end of the month, when the rams are to be withdrawn from the ewes.

December.—The ploughing of stubble land may still go on during this month, when the weather permits. When stopped by frost, cart out manure for use in spring, taking care to put it into a close compact heap, so that none of the juices may be lost; and a quantity of turnips should be drawn and stored near the homestead, ready for use.

The cows and live stock will be fed as in the previous month; the breeding ewes being allowed the range of the farm, and in frosty weather supplied with a little hay.

January.—Little out-door work can, in general, be done this month, and thrashing and in-door employments are better suited to the season. Still, when the weather permits, the farmer must not be idle; but should set to work, to turn up the grass land intended for crops, in order to have the turf well rotted, and that the soil may be mellowed by the frost.

February.—When the weather permits, the land intended for beans and spring wheat must be ploughed and got into order, and the seed should be put into the ground this month, if possible.

The breeding ewes, will now require a good allowance of turnips and mangel-wurzel, to strengthen them for the lambing season.

March.—This is a busy time for the husbandman, and every exertion should be made to get the work well forward. Spring wheat may now be sown where necessary, and the oat crop must be got into the ground, and the land intended for potatoes and turnips should receive a cross ploughing. It may probably be yet too early to use the roller on wet lands, the rolling of which may be delayed till next month; but the use of the roller to pulverize the soil should never be omitted, as soon as the land is in a fit state.

The ewes will now be beginning to lamb, and will require great care, and constant attention.

April.—As early in the month as possible, the remainder of the oats must be sown. The potato land must be again ploughed, reduced to a fine tilth, and the seed planted. The barley must also be sown, in course of the month, as must likewise clover, mangel-wurzel, vetches, and lucerne. Grass land intended to be mown, must now be cleared of stones and rubbish, and be bush-harrowed and well rolled. This is absolutely essential, and should never be omitted. Attention must also be given to the preparation of the turnip land.

About the end of this month brood mares will foal, and the cows will calve. Neither should be turned out to pasture until the grass is sufficiently forward, and they must have a good supply of Swedish turnips, winter tares, hay, and chaff, in the house.

May.—Barley sowing should be finished before the middle of this month. Vetches may still be sown. The remainder of the potatoes must be planted, and the drills of those planted last month may now be hand-hoed, or have the harrow passed over them. The beans should also have the drill harrow sent through them. About the middle of the month, Swedish turnips should be sown, the land being previously well prepared: and the oat and barley crops must now be cleaned of all thistles and other weeds.

The young stock may be turned out to pasture, and the business of the dairy will proceed briskly.

June.—Turnip sowing may be continued throughout this month. Constant attention must be given to horse and hand hoe the potatoes and beans; and by the end of the month, the Swedish turnips will also require to be hand-hoed.

The sheep may now be shorn, and the early lambs will be getting ready for market, and should therefore have the best grass the farm affords.

July.—This is the time for hay-making, which calls for great vigilance and activity on the part of the farmer. The grass must not be permitted to ripen its seeds, and in making the hay, be careful to preserve as much of the natural juice or saccharine matter as possible. Horse and hand hoeing, must still go on diligently among the turnips, potatoes, mangel-wurzel, and beans; and turnip sowing must be completed by the middle of the month, after which a good crop can hardly be expected.

Lambs which are to be kept for stock must now be weaned, and sent to good pasture at a distance from the ewes.

August.—The beginning of this month will be chiefly employed in carting the hay from the field to the steading. In favourable seasons, reaping will commence the first or second week, and the farmer should be careful to cut his corn as soon as it is ripe, and get it into stook as quickly as possible.

September.—All the farmer's attention will now be directed to the securing of his grain crops. Whenever the corn is thoroughly dried in the stook, it must be carted home to the stack-yard; and remember that an opportunity neglected, may never be recovered. During this month and the next, the potatoes must be taken up, and secured in pits for the winter. In some situations wheat may be sown this month, although the general wheat sowing rarely takes place before October. The bees must be attended to the latter end of this month, and the superfluous honey removed, and such arrangements made as will carry your hives on through the ensuing winter and spring.

In this short summary of operations throughout the year, although much is omitted, and what is given is necessarily very brief and imperfect, it is yet hoped that the farmer may find something that is useful, and that will serve to remind him, generally, of the work to be performed at each season.

APPENDIX.

DOMESTIC ARRANGEMENTS.

To the foregoing directions for the guidance of the farmer, we here propose to add, by way of Appendix, a few brief observations more especially referable to the domestic arrangements of the Agricultural Labourer. No one connected with land, whether it be as landlord or tenant, can be insensible of the vast importance of this subject, in all its bearings; and no right-thinking man, whatever his rank or station in life, can be otherwise than desirous of doing all within his power to improve the labourer's condition, physically and morally,—to make him better, wiser, happier; and as comfortable and independent as his social position warrants and requires.

To accomplish this object, we must in the first place extend to the whole of our labouring population the benefits of moral and religious instruction, together with such other aid and guidance, as will ensure the training up of their children to become useful members of the community; and in the next place we must use our best endeavours to improve the physical condition and the social habits of the working classes generally. All this is necessary for the sake of the employer, no less than for that of the labourer himself, and for the well-being of society at large; and it is with a view to the furtherance of this most important object, that the following observations are here inserted.

These observations may, moreover, not be altogether without their use to the small farmer, and other persons in a similar class of life, by awakening thoughts and pointing out objects which else possibly might not have occurred to them, but which are nevertheless deserving of every attention; and it is hoped that the Farmer will not consider that he is unprofitably employed, if he devotes some time and some pains to impress what is hereinafter stated upon the attention of his people.

Under the general heading of "Domestic Arrangements," are included observations on The Garden, On Health, Food, Clothing, Dwellings, Provident Habits, Marriage, and Children: each and all are subjects of great importance, and The Garden is placed first, because we consider it in truth as second to none in its influence upon the condition of the labouring man. The possession of a quarter of an acre of garden-ground may, and often will, make to the labourer and to his family the difference between want and sufficiency, between privation and comfort, between a contented mind and a cheerful fulfilment of the duties of his station, and a mind soured, hardened, and dissatisfied, prepared to yield to vicious promptings, and to rush recklessly into breaches of the law.

The garden need not be large; about a quarter of an acre will perhaps be generally sufficient for the labourer's purposes; but at any rate it should not be of an extent calculated to interfere with other occupations, nor to occupy time which ought to be devoted to daily labour. It is to be hoped that the time is not distant, when every labouring man, whether Agriculturist or Artizan, will have the benefit of a garden of this description, than which, we are persuaded, nothing can more conduce to the comfort and well-doing of himself and his family, and to the peace and security of the community, of whom the labouring classes form so important a portion.

THE GARDEN.

A productive garden is not only a luxury and source of enjoyment to the rich, but it is also a constant source of amusement, and supplies many of the wants of the poor. No labouring man, whether agriculturist or mechanic, is so unceasingly occupied, that he cannot spare half an hour each day for his garden; and no one confined to in-door employment, ought to be without the exercise and the exertion required for keeping a small garden in good order. His wife and children will be benefited by the light labour of a garden, and the artizan will, by such occasional change from his ordinary employment, secure more constant and vigorous health. The sowing and the planting of his vegetables, the blossoming of his trees, and the gathering of his fruits and flowers, will all afford interest and gratification. It is an amusement to be coveted beyond all others, and leads to nothing but good, to nothing sensual or vicious. It cannot give rise to bad habits, but, on the contrary, will serve to protect a man from the allurements of dissipation and vicious indulgence.

A garden is, in fact, essential to the health and comfort and well-being of the mechanic and the labourer, and a garden may also be said to be essential to the comfort and enjoyment of the farmer of every class.

In the case of the day-labourer, what can be so delightful as half an hour spent in his garden, with his wife and children around him, after his daily toil?—The change from laborious exertion, to the lightest of all out-door occupations, must be to him a relief.

To the farmer, how many broken hours will pass unemployed, and without enjoyment, if he has not a garden in which to occupy his time, and in which he may occasionally try experiments on a small scale, or verify the experiments of others, before carrying them into practice on his farm.

Children are frequently led into mischief, in the absence of other means of occupying themselves. How different would it be, if they were taught to turn their attention to the neatness and productiveness of a garden?—They would then be anxious to show their parents, how usefully they could be employed: and what an instructive lesson would it be for them, to find the luxury of flowers and fruit rewarding, in due season, their care and industry?—How delightful to see them advising and assisting each other to obtain such an object?—How peaceful and innocent is such an amusement, and what a contrast does it present to rudeness, quarrelling, and fighting, or idling away their hours in riotous games?

In selecting the situation of the garden, the soil is of secondary importance, for in this respect it will improve every year, by trenching, draining, manuring, and by bringing good earth to the favourite spot: indeed, some persons choose the poorest soil for the garden, in order to show their skill and perseverance in its improvement, to which nothing more contributes than trenching the ground deep, and throwing it up into rough ridges, for the frost to act upon during the winter, and the sun in summer.

The garden ought, however, to have a southern aspect if possible, and it is desirable that it should be within sight of your house. Devote a border to flowers; and if the garden is of sufficient size, you may have cherry and plum trees nearest the house, summer pears and apples next, and the winter and baking sorts farthest off. Cherries and plums are best kept from birds near the house; and summer fruits when in sight, are in less danger from pilferers, than the winter sorts. Gooseberries, currants, and strawberries will grow between the standard trees, or around the plots of vegetables. If you can bring a small stream of water into the garden, it will be a great convenience for watering, in dry weather; or the well for household use may be situated there. The garden should be fenced in with a stone wall, or a good quickset hedge, to protect it from intruders, which may else break in and do more mischief in half an hour, than can be repaired in months.

If the garden is of good size, and properly attended to, it will afford apples, pears, plums, cherries, gooseberries, strawberries, raspberries, and currants, as well as abundance of vegetables for the use of your family, and something also occasionally for your pigs and poultry. In apples and pears, choose those sorts which usually thrive well in the neighbourhood. This is the best rule, for different sorts do best in different soils and situations. In plums, the common Orleans, Damson, and Wellington, are to be preferred. In cherries, the Mayduke, and Morello. People often go to the nurseryman for new sorts of apples, &c., and get bad or unsuitable kinds; whereas it would be better for them to obtain cuttings of suitable sorts for grafts, from the neighbouring orchards or gardens.

Thin out the centre shoots and branches of the fruit-trees, and of the currant and gooseberry bushes, that the fruit may be exposed to the sun and air, and it will then be larger and better flavoured. Keep your trees low and spreading, so as to avoid loss of fruit by shaking from high winds; and in gathering the fruit, be careful not to break the branches, or injure the trees. It is a sure sign of carelessness, to see the apple and cherry trees with their top branches broken and torn away.

Attend to the currant and gooseberry bushes as soon as they are in full leaf, and let every caterpillar be picked off. Each bush should be examined twice a week at that time (generally about the middle of June), which will occupy a little boy or girl two or three hours, and you will thereby ensure the protection of your trees: but if neglected at first, the caterpillars will spread, the fruit will be destroyed, and the trees will be much injured. A bunch of common broom stuck in the centre of each bush, will often serve as a protection from caterpillars; but the most certain protection is to pick them off.

Plant the raspberries in rows along the walks, and either tie the heads of the adjoining stems together, so that every two may form a kind of arch; or else tie three or four of the stems to a stake, stuck firmly into the ground, first cutting off the heads of the stems at the height of three to four feet.

One of the most useful vegetables is the early potato; and after taking these up, you may plant cabbages or cauliflowers, which are always valuable as a garden produce. The chief enemies to the cabbage are snails and slugs, and in some situations a white worm at the root. As a preventive for each of these, and at the same time a serviceable manure, water the soil frequently with strong lime water. Lay a few cabbage leaves on the ground before dusk, as snail and slug traps, and visit them in the morning before it is broad daylight, when you will find them covered with these destructive vermin, which may thus be readily destroyed. A few tiles, or hollow flattish stones, may also be laid about, and lifted in the day-time, and the slugs found under them destroyed. Without such precautions, a whole planting of cabbages or cauliflowers may be lost in a few nights.—For general instructions as to sowing and planting, see page 111.

To raise turnip or cabbage seed, choose a few fine plants, and place them by themselves, out of the reach of other blossoms, to prevent the different kinds getting mixed, which is very apt to happen, unless carfully guarded against.

Onions, are a very useful vegetable. They may be sown on the same ground for a number of years in succession, by preparing it for the purpose, and adding such soils as will constitute a dryish loam. Stimulating manures, such as soot, pig and pigeon dung, lime, &c., are all good for onions, when used with discretion. The best sorts to cultivate are the blood-red and Strasburgh; and they succeed best when sown mixed. Dig the ground well, working it very fine, and sow the seed about the latter end of March, or the first week in April.

Leeks, are also a useful vegetable in a cottager's family; they are hardy and productive, and are managed much in the same way as onions.

Carrots, are very valuable, and grow well in any kind of soil, provided it is dry and deep. The seed should be sown early in April. A little seed mixed with onions, is not a bad practice in a small garden; for if the latter fail you are certain of large-sized carrots, and if the onions turn out well, the carrots may be either weeded out, or drawn and eaten young. Carrot seed should be steeped in water *before* sowing, and then mixed with dry sand, that *it may be* sown the more readily.

Beet, is a useful garden produce, and if planted out early, may be taken up in August, when you may put in winter cabbage. Sow the seeds in April, and transplant by a dibble, in well-dunged ground, in May. Cut off the tops in November, when they may be eaten like spinach, and then store the roots out of the reach of frost, for winter use.

Parsley, is a useful herb, and will grow anywhere, and it will propagate itself, if one or two plants be allowed to run to seed occasionally.

Chives, are almost as useful as onions, and should be grown in every cottage garden. The plants can be readily procured, and they increase very fast.

Peas, are a very useful vegetable in a family, and if you sow the dwarf kind, in drills, three feet apart, they will require few sticks to support them, and will, indeed, do without any, although not so well. The taller kind of peas require more room, and will need to be well supported with sticks.

Beans, are also a very useful vegetable, and may be planted singly, in rows two feet and a half or three feet apart; or else they may be dibbled in between your cabbage plants, in March. The best sorts are the Windsor and Mazugan.

Of other vegetables there is a great variety, but they need not be particularized here, the above being generally sufficient for the small farmer's or the cottager's garden.

Quantities of Seed suited for a Cottage Garden.— One pint of peas will sow fourteen yards of a drill; one pint of beans will sow twenty-two yards of a drill; one ounce of onion seed will sow ten square yards; half an ounce of leek seed will sow six square yards; one ounce of carrot seed will sow ten square yards; one ounce of parsnip seed will sow twelve square yards; half an ounce of cabbage, savoy, brocoli, or cauliflower seed, will sow between three and four square yards.

Flowers, should be cultivated in every garden, especially if near the house; in which case, if not in every other, the Garden certainly ought not to be limited to the production of vegetables merely, but should contain the ornamental, as well as the useful. Too much time and space must not, however, be devoted to flowers; and we will only mention a few of the more hardy sorts, which may be easily managed, and which will be pleasing at all seasons of the year.

Climbing over the porch, or around the door, you may have a few of the hardy tall-growing roses, for ornament. Common monthly or China roses may cover the corners of your house, or be trained under and along the sides of the windows, mixed with laurestinus, arbutus, and pyracantha; nor let the honeysuckle be wanting in some corner, twisted round a tree, or hanging over a corner of the wall.

Have plants of the hundred-leaved, moss, cabbage, variegated, and common blush roses, in the corners of your garden nearest the house; and in the borders, plant snowdrops, crocuses, hepaticas, the winter aconite, red and yellow tulips, white and yellow bachelors' buttons, primroses, anemones, narcissus, cowslips, polyanthus, white and yellow lily, stocks and wallflowers of different colours, dahlias, hollyhocks, jonquils, violets, and the pretty little Virginia stock, and any other annuals you like or can procure.

If you edge your flower-borders with the garden daisy, and the hardy sorts of auriculas, there will be few days in the year in which some pretty little flower will not peep forth, and afford you pleasure in looking at it. A holly, bay, laurel, or rhododendron, will do well under shade, and their perpetual green will refresh your eyes in winter: and be assured that such objects as a garden presents, if it be neatly kept, are always valuable; for they do the heart good, and impart a kindly tone of feeling and refinement, and serve to keep out evil thoughts.

Encourage your children in a taste for flowers. Teach them to plant the seeds and roots, and to weed and keep them clean, and train and cultivate them; and the taste will remain with them when they grow old. It is on such things as these, in the recollection of bygone days, that local attachment is founded, making us delight to revisit the scenes of our childhood, and bringing back the wanderer from distant climes, to seek a last resting-place in the home of his fathers.

ON HEALTH.

The possession of health, is one of the greatest blessings that can be bestowed upon man, whatever be his rank or station in life; and to the labouring man it is so essential, that his very existence may be said to depend upon it. Without health, the labourer will be unable to pursue his labour, or obtain the means of supporting his family; and without health, the farmer will be unable to attend to his business, or take part in the labours of his farm. You cannot, therefore, be too careful to preserve unimpaired, that on which so much depends.

Under ordinary circumstances, the preservation of health will in great measure depend upon a person's habits, and upon the nature and sufficiency of his food, his clothing, and his habitation. On each of these we purpose to remark; and we will, in the first place, offer a few general recommendations in regard to health, by attending to which you will, it may be hoped, escape the visitation of sickness; whilst a neglect of them, will too probably entail disease and suffering upon you sooner or later.

Every excess, whether in eating, or in drinking, ought to be resolutely avoided. The appetite satisfied, anything beyond what is necessary for that purpose, is injurious; and numerous diseases spring from excess in this respect. In case of indisposition, which will not yield to the application of such simple remedies as are within every person's reach, it is always safest, and in the end will be the best economy, to seek the aid of a competent medical man, whose directions should be strictly adhered to.

Prevention is, however, always better than cure; and as illness may certainly be often prevented by avoiding excess in eating and in drinking, so may it often also be avoided by due care with respect to clothing. Nothing is more likely to occasion chill, and produce fever, than wet clothes. Whilst working, or taking violent exercise, the body is generally enabled to resist the effect of wet garments; but to sit still, or lie down in wet or damp clothes, is almost certain to produce cold, and most likely fever, rheumatism, or other serious ailments. You should therefore endeavour to be always provided with a change of clothing, so as to have dry garments to put on, in case of your getting wet. Wet clothes are the cause of many severe illnesses.

With respect to habitations, much might generally be done for increasing their comfort and convenience, as well as for rendering them more healthful. You should carefully avoid having any stagnant pools, about your dwellings. The exhalations from these, and from collections of dung, and vegetable and other matter in progress of putrefaction, are at all times pernicious, especially in hot weather, inducing fever and other illness. The ground immediately round the house, should be drained, and kept as dry as possible; and the manure and offal of every kind should be removed to such a distance, that no offensive exhalation may reach your dwelling.

The interior of the house is the wife's peculiar province, and her character and estimation with her husband and with her neighbours, will mainly depend upon the order and neatness with which it is kept; and when it is remembered that the comfort and health of her family will also greatly depend upon her activity and good management in this respect, no other incentive can be required to stimulate a correct and right principled woman to the vigilant performance of her duty.

However small the rooms, they should be kept dry and clean in every part, and the walls should be whitewashed as often as they require it. No wet clothes must ever be permitted to hang in the room you inhabit. The floors should be swept, and the dirt and rubbish of every kind removed to the dung-pit.

The rooms should be duly ventilated, and especially in the morning, when the doors and windows must be opened, and the fresh air freely admitted. In case of illness, particularly fever, this is of the greatest importance; for without such precaution, infectious fever is sure to spread, and attack every one within its reach. We cannot in fact too carefully attend to the cleanliness and ventilation of our dwellings, as a means of preventing the occurrence of illness, and of lessening its ravages, in case it should unhappily break out among us.

The comfort of every one will greatly depend upon personal cleanliness, and even success in life may be considerably influenced by its observance; for where there is an habitual want of cleanliness in a family, it is certain that the indolent and slatternly habits in which it originates, will influence every family arrangement; whilst the same attention, activity, right judgment, and forethought, which secure cleanliness and good order in a dwelling, will generally extend to other matters, and conduce to success.

FOOD.

Food is the prime necessary of life, and we ought not only to endeavour to obtain a sufficient quantity, but also to direct our attention to the best and most suitable kinds of food, and to the most convenient and economical modes of providing it.

Without being the slaves of our appetites, it is right that every man, whatever his station in life, should endeavour to obtain food pleasing to the palate, as well as nutritious to the frame. Weakness of the stomach, may be produced by want of a sufficient variety of food, or by want of food sufficiently stimulating; and many diseases originate in the derangement or imperfect action of the organs of the stomach, arising probably from this source.

With a few trifling additions and changes, the food of the labouring man may often be rendered both more agreeable and more salutary than it usually is, as now prepared. Fish, when within reach, forms a valuable addition, whilst eggs, butter, honey, cheese, and bacon, may, by care and forethought, be obtained occasionally, in moderate quantities, by every one who has land or a bit of garden. Many an excellent meal, for instance, might be prepared from cabbages, boiled and chopped small, sprinkled over with salt and pepper, with the addition of a handful of meal or flour, a slice of bacon, or a little lard or fat of any kind; and the entire cost in money of such a meal for a whole family, would not exceed a few pence. Turnips, potatoes, carrots, or other vegetables, might be added to the mess according to circumstances. Onions, leeks, and garlic, are of great value in cottage cookery, and the Spanish people, who consume large quantities of each, are remarkable for their robust and healthy appearance.

Without entering into minute details, it may be mentioned, that salt, onions, chives, or parsley, and a little black pepper, not only give relish to a mess formed of potatoes, cabbages, or other vegetables, but also prevent flatulency, and those diseases arising from the too great use of vegetable diet; whilst butter, suet, the fattest parts of bacon, and other grease, should be reserved for laying over potato puddings, and frying watery kinds of fish, which are less nourishing if simply boiled.

Meat used cold is less nourishing, and does not go so far as when eaten hot; and if it be made into broth or soup, it goes twice as far as if roasted, baked, or boiled. All broths, stews, and hashes of meat, mixed up with vegetables, and flavoured with parsley, chives, and onions, salt and pepper, are better and cheaper, and more nourishing and comfortable for the working man, than plain meat. A single ox-head, with a small quantity of oatmeal, or flour, and a few onions, leeks, cabbage sprouts, sliced turnips, or any kind of vegetable, will make twenty quarts of good broth.

If the fish be salt, make it into a pudding, chopped small, and mixed with potatoes, and some onions or chives, and seasoned with a little pepper; this is better than eating it simply boiled: or if a little lard or butter, or any kind of grease, can be spared, and mixed up with it, and it is then placed before the fire till browned on the outside, the mess will be much improved.

When cod, ling, hake, or other white fish is eaten fresh, it should be well cleaned and trimmed, then cut in pieces and put into the pot, and covered with water; some potatoes scraped or peeled should be added, with a little parsley, and chives or onions, chopped small, with pepper and salt; and whilst boiling, the liquor should be skimmed carefully, so that it may be quite clean. This makes a capital soup, whereas if the fish were simply boiled, and the water thrown away, half the dish would be lost.

In whatever mode the victuals are prepared, the utmost attention should be paid to cleanliness. Without it, the best food will be rendered unwholesome; and with it, indifferent food is rendered pleasing to the palate, as well as wholesome and nutritious. Emaciated looks as often proceed from want of proper care, skill, and cleanliness, in the preparation of the food, as from an absolute want of the means of obtaining it.

As to liquids, there can be no doubt that water, the drink of our first parents, is the most salutary. Beer may be fattening, and spirits, in case of fatigue or great exhaustion, may appear to give a temporary relief; but whilst millions of human beings have been injured or destroyed by the too free use of spirits and malt liquors, not one has been injured by the use of water, which possesses a purity that not only prevents, but often removes complaints; and it is proved beyond a doubt, that in cases of great exhaustion from cold, a pint of warm water will be a better restorative than spirits or strong cordials, which only excite a kind of fever at the moment, and are in fact, where habitually used, a species of poison.

Happily, the strength necessary for bodily labour, does not depend upon a luxurious diet, but upon a sufficient supply of simple nutritious food; and under ordinary circumstances, every man in good health of mind and body, may obtain a sufficiency, if he will make due exertion, and exercise proper care and forethought.

CLOTHING.

The kind of clothing most fitting to be used, must always depend, in a considerable degree, upon the circumstances and occupation of the individual, and upon local situation. Strong cloth or other stout stuff, made into breeches or trousers, a short coat or round jacket, and worsted stockings, are however the dress which is generally most suitable for a man who has to labour for his living exposed to the vicissitudes of the seasons; to which may be added, for rough and rainy weather, a frock, and a top-coat, reaching to the knees. Each person should have two pair of shoes, a strong pair for hard work, and another pair for light work, Sundays, or in-doors. Indeed, if there were more than two, so that each pair might have time to become dry after being worn, it would in the end be found a saving, for shoes will last much longer, when so used. Dirty shoes ought never to be admitted beyond the porch, where a dry pair should be kept in readiness for use in the house.

There is such a variety of articles for female dress, that it may often be doubtful which is best adapted for any particular situation; but for outer garments, woollen is in general to be preferred to cotton, which although gay-looking and cheaper at first, sooner loses its colour, and does not wear so long. Red and blue cloaks, and dark checkered woollen shawls, are comfortable, and well-looking; and a bonnet is indispensable for every woman who wishes to preserve her good looks, and avoid premature wrinkles. Everything beyond what is necessary for cleanliness and comfort, and for neatness and decency of appearance, should be avoided in dress, whether it be of male or female.

For the dress of children, warmth should chiefly be studied. An economical wife, who is a good needlewoman, will often manage to clothe her children neatly, from parts of her own and her husband's old garments; and her little ones may thus be decently clothed at a trifling expense. This, however, will much depend upon her skill and ingenuity, and it cannot be too strongly recommended to every female, whether wife or daughter, to pay attention to neatness and cleanliness in the children's persons and clothing, as well as in her own.

The old proverb says, that "a stitch in time saves nine;" and wherever attention is manifested in the careful repairs of the family clothing, we may be assured that comforts of other kinds will not be wanting within doors. An old, but clean and neatly-mended child's dress, or husband's working garment, bespeaks the thrifty housewife, and implies habits the very opposite of those indicated by dirty or ragged clothes, which are a sure mark of the wife's indolence and neglect.

DWELLINGS.

A porch adds greatly to the warmth, cleanliness, and general comfort of a dwelling, whatever be its size, whether large or small. In the house of the small farmer, or the cottage of the labourer, the porch serves as a receptacle for the wet jacket, hat, and dirty shoes of the husband, as well as for the brooms and brushes of the tidy housewife, who should never permit anything dirty to be brought beyond the porch, to soil her neatly-kept apartments. Such a regulation will add greatly to the general comfort, and prevent dirt and slovenliness, which a want of attention to such an arrangement is sure to occasion.

From the porch we enter the kitchen, or cooking and eating apartment, in which the family usually live, and where all the ordinary in-door operations are performed. It is therefore the more important that this apartment should be kept neat and clean, and that all the arrangements connected with it should be made with a view to convenience and comfort.

The chambers or sleeping rooms ought to be so disposed, as that none of the decencies of life should be violated. In no human habitation, of however humble a class its inmates may be, ought the younger members of the family, of different sexes, to be permitted to occupy the same bed-room, after the age of ten. It is of the utmost importance to their character and well-doing in after-life, that the males and the females, the brothers and the sisters, should have different sleeping-rooms. If this is not attended to from an early period, the delicacy and correct feeling which constitute a chief charm, and are among the chief guards, of the female character, are sure to be destroyed, whilst the character of the males will be similarly injured. The subject is well worthy the attention of every parent and head of a family, and ought never to be lost sight of.

Whatever may be the size and number of the bedrooms, they should all be kept clean and neat; and whatever may be the hurry of the day, breakfast should never be eaten without opening the windows for the admission of fresh air, and having the kitchen, the porch, and the doorway cleanly swept.

As a general rule, the bed-clothes should be shaken, the beds made neatly up, the dishes washed, and the whole house aired and swept, as a first duty, every morning. There must be no excuse of want of time to carry away ashes, sweepings, and dirty water, which should be always added to the dung-pit, and not be merely swept into a corner.

In the management of a house, all should be done methodically every day, and then there will be really less time and less labour required. Indeed much ought to be done by the children, where there is a family, to give them habits of order and usefulness. There is no child, even of six years old, who cannot assist in such duties; and when it is considered that carrying the dirty water, ashes, or refuse to the proper place, instead of throwing them anywhere else, will generally not occupy above five minutes, this time will surely not be deemed too much for ensuring comfort, cleanliness, and economy; for it must always be remembered, that nothing is more wasteful and expensive than dirt and slovenliness.

PROVIDENT HABITS.

No considerate person can be insensible of the importance and the necessity of making provision for old age, when infirmities will come upon us, and when, from inability to continue daily labour, privation and suffering will surely overtake the improvident; for it is only by the exercise of industry, forethought, and frugality in the season of youth and health, that the effects of want in the period of old age and infirmity can be averted.

To some persons, the saving of anything out of what they earn by their daily labour, may perhaps seem impracticable; but most people know, that in this respect more depends upon their own care and resolution, than upon the actual amount of their earnings; whilst many who have both the means and the disposition to save, have not acquired the habit of saving, simply because they never made the trial. Let such persons only resolve to make a beginning, and try how many sixpences can be saved in one year, and the difficulty will vanish.

Whatever you save, lodge it securely in a savings bank, and trust not the money hardly gained by your labour, in the hands of private individuals, nor even in your own keeping. With the former it may be lost by misfortune, fraud, or extravagance; and in the latter case, you may perhaps be tempted to spend or waste it, and thus lose the fruits of your previous self-denial.

Where is the man who can truly say, that between the ages of eighteen and thirty-five, he had it not in his power to save so much as 6*d*. a-week?—and what man has ever made the trial in vain, if he set about it earnestly? However backward to commence saving, and however positive a man may have been that nothing could be saved, there is yet, we believe, hardly an instance in which the commencement of saving has been entered upon, that he has not gone on adding to the fund, and making increased economical exertions; and such we are satisfied will be the case in every instance, if a person will only make the first effort. To begin is, in fact, to succeed.

In connexion with provident habits, we will further say something upon the important subjects of marriage, and the education and training of children; for on the adoption of right principles of conduct upon each of these important points will depend, not only your own welfare here, but your and their happiness hereafter.

MARRIAGE.

The necessity for much careful consideration before engaging in so important a contract as that of marriage, must be self-evident to every one; and yet how many are there who hasten to become united for life, without at all considering the consequences!

In declaring marriage honourable, it is most certain that Scripture does not countenance the wickedness and folly of entailing poverty, strife, and sorrow upon ourselves and our offspring. On the contrary, it supposes the married state to be one of content, affection, and increased happiness in all the relations of life. But is such the actual, or can it even be the possible result, of the way in which so many persons, often at an early age, recklessly plunge into that most solemn of earthly contracts? Can such improvident marriages be right, or honourable? Is not the common maxim true, that "when poverty enters in at the door, love flies out at the window?" How, then, can happiness be expected in the married state, unless we render ourselves worthy of it by previous preparation, and by prudent and reasonable conduct?

Young persons too often think themselves old and wise enough to marry, and take upon themselves the management and control of a family, before they have become able to regulate their own headstrong passions; and, regarding marriage as a kind of lottery, they recklessly plunge into the most important of all earthly engagements, without consideration, and without having made any provision for discharging its obligations.

How common is it to see two individuals marry, and bring helpess beings into the world, without having made the slightest provision for their support, and whose own subsistence, from the very commencement of their union, depends altogether upon resources which sickness, and a thousand accidents, may in an instant destroy! Such persons may appeal to Scripture, and endeavour to shelter themselves under the plea of trusting to Providence: but Providence has given us reason for the regulation of our conduct; and to neglect the admonitions of reason is to tempt Providence, and set its dictates at defiance.

To descend to the level of irrational beings, and to cast our offspring upon the world, with as little consideration about their future well-being as the ostrich shows, when she drops her egg into the sand, and leaves it to be hatched by the sun, cannot surely be a proper reliance on Providence. It is, on the contrary, direct improvidence, such as can only result from a degradation of the higher faculties of our nature; and it produces results, which daily cause the good and humane to weep.

No rational creature is justified, either in the sight of God or man, in putting him or her self in the position of bringing human beings into the world, without the means of providing for their support; and he who becomes a father, without a prospect of being able to keep his children from the miseries of want and beggary, is guilty of a crime very little inferior, in a moral sense, to that of exposing his child to perish on the highway.

We by no means deny to any class of the community, but on the contrary would earnestly wish to secure to every class, all those comforts and enjoyments which spring from the exercise of domestic virtues and the social affections: but every individual, of every class, is bound to keep the animal impulses under the control of reason; and so to act as not to wreck his own happiness, and the happiness of others, by a disregard of the dictates of prudence, thereby levelling himself with the brutes of the field.

Those who are about to enter into the married state should ask themselves, or else they should be asked, whether they are aware of the duties and the burthens it will bring upon them, and if they have a reasonable prospect of being able to meet these when they come? —If they have not, they will assuredly be preparing a life of misery and privation for themselves and their offspring. In so acting, they will likewise injure their neighbours, by throwing upon them burthens which they themselves ought to support, and by bringing more labourers into the world to take employment and food from those who may already not have enough.

TRAINING OF CHILDREN.

The instruction of your children cannot commence too early. Every mother is capable of teaching her children obedience, humility, cleanliness, and propriety of behaviour; and it is a delightful circumstance that the first instruction should thus be communicated by so tender a teacher. It is by combining affectionate gentleness in granting what is right, with judicious firmness in refusing what is improper, that the happiness of children is promoted, and that good and orderly habits are established. If children are early trained to be docile and obedient, the future task of guiding them aright will be comparatively easy.

The training and education of children, can, however, be only regarded as a means to the attainment of an end; for all acquirements, all learning, are valueless, if they do not make us better in our several relations of parents, children, husbands, wives, and unless they lead us to the practice of that divine precept of our religion, "Thou shalt do unto others as thou wouldest wish others to do unto thee."

Supposing, then, that you have secured for your children the benefits of education, that they have attended an infant and afterwards an adult school, and that they have been advanced in the different branches of instruction, as far as is necessary for the pursuits in life to which they are destined—something else is yet required of those to whom an offspring has been given—you are still called upon, as parents, to attend to their religious and moral training; and to take care that, after right precepts have been imparted, your children may not be corrupted by your own evil example.

If a parent supposes that his vices can be hidden from his children, he is greatly mistaken; for children are quick in the perception of what is wrong, and in reasoning upon it, and imitating it; and if, with the words, "Thou shalt not steal," in your mouth, you nevertheless make use of anything not your own, or take undue advantage of others, you are practically destroying the force of the precept, and teaching your children to be dishonest.

How can it be expected that your children will have a horror of drunkenness, if they ever see you drunk, or if drinking is talked of by you as an object of gratification? If you encourage your children by promises to confess a fault, and afterwards punish them for it, do you not practically discourage their afterwards telling you the truth? Or if you hold that nothing is to be said which can in any way injure your own interests, and say, "Remember not to tell so and so," can you expect that your child will not lie, whenever it suits his own purpose?

If you are violent and intemperate in your demeanour, if your language is coarse and brutal, if your manner is overbearing and insolent, will not your children be infected by your example; and are you not crushing in the bud the truly estimable and Christian qualities of gentleness, forbearance, and charity?

It has been well said, that "Drunkenness expels reason, distempers the body, inflames the blood, impairs the memory, is a witch to the senses, a devil to the soul, a thief to the purse, a beggar's companion, a wife's woe, and children's sorrow; and that a drunkard is the picture of a beast, a self-murderer, one who drinks to the good health of others, and destroys his own, as well as the happiness of those whom he ought to protect, love, and cherish." You need not be guilty of this vice, or the other vices, *in a gross degree*, to influence your children by your example; and you must abstain from vice altogether, if you wish to train up your children to the proper fulfilment of their duties, so as to secure their welfare here, and their eternal happiness hereafter.

WEIGHTS AND MEASURES.

The following Tables of Weights and Measures are inserted here, as being likely to be useful to the farmer :—

WEIGHTS.

16	Drams	make	1	Ounce.
16	Ounces	„	1	Pound.
14	Pounds	„	1	Stone.
28	Pounds	„	1	Quarter.
4	Quarters, or 112 lbs.	„	1	Cwt.
20	Cwts.	„	1	Ton.

MEASURES.

4	Gills	make	1	Pint.
2	Pints	„	1	Quart.
4	Quarts	„	1	Gallon.
2	Gallons	„	1	Peck.
4	Pecks	„	1	Bushel.
8	Bushels	„	1	Quarter.
5	Quarters	„	1	Load.

Note.—An Imperial Bushel of fine Wheat will weigh 63 lbs., whilst much of the inferior sorts will not exceed 53 lbs. Fine Oats will weigh 42 lbs., ordinary Oats only 36 lbs. per Imperial Bushel. Fine Barley weighs 55 lbs., good 52 lbs., and ordinary 48 lbs. per Imperial Bushel.

SQUARE OR LAND MEASURE.

9	Square Feet	make	1	Square Yard.
30¼	Square Yards	„	1	Square Pole, or Perch.
40	Square Poles	„	1	Rood.
4	Roods	„	1	Imperial or Statute Acre.
640	Acres	„	1	Square Mile.

Note.—70 yards square, or a square of 70 yards each way, make one statute acre, nearly.

LONG MEASURE.

12	Lines	make	1	Inch.
12	Inches	„	1	Foot.
3	Feet	„	1	Yard.
5½	Yards	„	1	Pole, or Perch.
40	Poles or Perches	„	1	Furlong.
8	Furlongs	„	1	Mile.
3	Miles	„	1	League.
69½ 60	Statute Miles, or Geographical Miles	„	1	Degree.
360	Degrees	„		The Earth's Circumference.

WOOL WEIGHT.

7 Pounds	make	1 Clove.	6½ Tods	make	1 Wey.
2 Cloves	„	1 Stone.	2 Weys	„	1 Sack.
2 Stones	„	1 Tod.	12 Sacks	„	1 Last.

THE QUARTER-DAYS ARE—

Lady-day	25th March.
Midsummer	24th June.
Michaelmas	29th September.
Christmas-day . . .	25th December.

London: Printed by William Clowes and Sons, Stamford Street.